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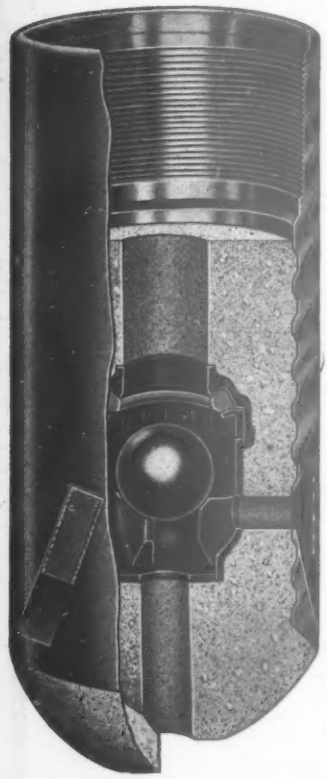
Here is Why Whirler Action is So Important Today in Washing Formation, Removing Bridges, and Cementing



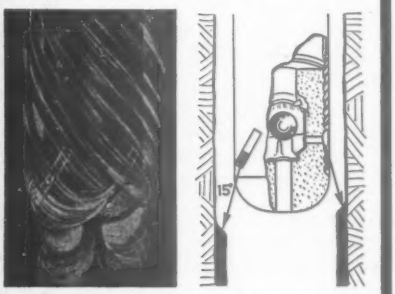
Under today's conditions, the securing of a successful first-time cement job is more than just "important" . . . *it is vita !* We can't afford to lose the additional man hours, rig time and materials required for a "second-time" job. They are needed to drill and cement a second well—not for second-time use on the same well.

Baker's contribution to this war-time problem, is making available cementing devices which afford every possible opportunity for securing successful results the *first time.*

An outstanding example of such a device is the *Baker Cement Wash-Down Whirler Float Shoe (usually used in combination with a Baker Cement Float Collar). This shoe not only assures safe and proper landing of the casing, but through its efficient "whirler action" provides best possible chance for complete encasement of the pipe with a uniform body of cement, with the hazard of channeling reduced to a minimum. In addition, when the cement job is completed, the internal construction of the Baker Cement Wash-Down Whirler Float Shoe can quickly and easily be drilled out leaving no harmful fragments in the hole to interfere with further deepening operations.

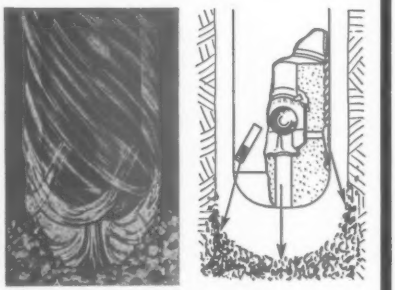
Field results have indicated that the whirler action afforded by Baker Cement Wash-Down Whirler Equipment is both effective and advantageous in washing formation, removing bridges and particularly in securing a better cementing job. ★ The whirling motion imparted to the fluid as it leaves the Shoe, is the basic reason for the unit's remarkable effectiveness. Another contributing factor is the slight angle from the vertical at which the fluid leaves the ports (there is no direct jetting action against the side walls of the hole). ★ The results operators are securing in landing and cementing casing with Baker Cement Wash-Down Whirler Equipment bears out the soundness of the engineering principles incorporated in these units. The illustrative sketches below (not drawn to scale) show these principles in operation.

WASHING FORMATION



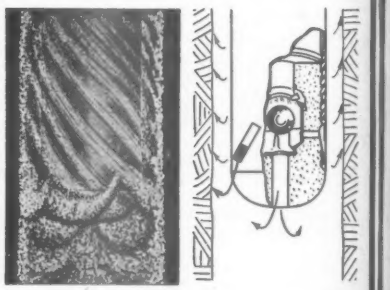
Note that the fluid is discharged through the baffled whirler ports at a slight angle from vertical (approximately 15°), effectively washing and removing at least a portion of the mud cake. There is no direct lateral jetting action against the side walls of the hole.

REMOVING BRIDGES



The angle of discharge through the baffled whirler ports of the Shoe directs the fluid against the *sides of the bridge.* The fluid which is discharged through the bottom of the Shoe also simultaneously attacks the center of bridge.

CEMENTING RESULTS



Uniform cement distribution is provided by effective whirling action imparted to fluid as it leaves the Shoe. Scouring action of the fluid preceding the cement, as well as scouring action of the first slurry as it strikes the formation, cleans the walls and affords best possible bond between the cement and formation at critical point—the Shoe and the Shoe joint.

Service Note

Competent Baker men will advise, make suggestions, and otherwise assist in securing best possible results.

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Awarded to Los Angeles Plant—1943

BAKER OIL TOOLS BAKER SERVING THE WORLD

the OIL AND GAS JOURNAL

Trends

Crude-Oil Production
By States — Page 94

CRUDE-OIL STOCKS 234,172,000 bbl. as of April 8—down 495,000. One year ago 239,925,000 bbl.

GASOLINE STOCKS 88,011,000 bbl. as of April 8—down 1,151,000. One year ago 93,410,000 bbl.

RESIDUAL FUEL-OIL STOCKS 51,072,000 bbl. as of April 8—down 254,000. One year ago 67,234,000 bbl.

GAS OIL AND DISTILLATE STOCKS 30,478,000 as of April 8—down 52,000. One year ago 30,970,000 bbl.

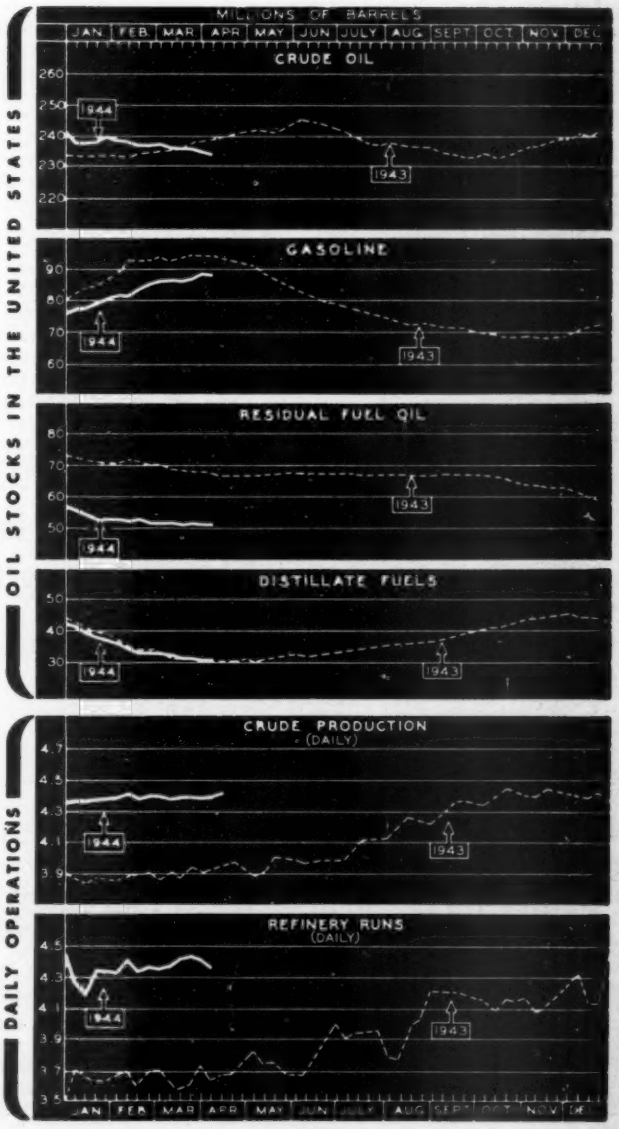
CRUDE-OIL PRODUCTION 4,437,620 bbl. daily average week ended April 15—up 19,110 bbl. Year ago 3,966,270 bbl.

REFINERY RUNS 4,354,000 bbl. daily week ended April 8—down 81,000 bbl.

REFLECTING mounting protests from producers and consumers of petroleum products, the Lea subcommittee of the House of Representatives started hearings Wednesday morning covering the distribution and supplies of products. Special attention is to be given to the extent and methods used in gasoline black markets and their effect upon civilian and war supplies. Reports indicated that before the investigation is completed the subcommittee will attempt to get up-to-date information on all factors having to do with production, refining, transportation and distribution, as related to the rationing of petroleum products, with the possibility that specific changes in governmental administration of oil operations will be recommended.

THE hearings, considered important in connection with probable trends in operations over the rest of the year, were preceded by statements from Petroleum Administrator Ickes and his deputy, Ralph K. Davies, condemning the spread of black market operations in gasoline. Ickes said in part: "The Nation's wartime gasoline distributing system has been invaded by the gangster, the racketeer, and even the killer. The Government alone cannot stop the black-market operator; the real power to halt these organized criminal gangs lies in the hands of the gasoline suppliers, the service station attendants, and the motorists themselves." Blasts from the heads of Petroleum Administration for War were accompanied by statements that no liberalization in gasoline rationing is to be expected anywhere soon.

THERE is considerable speculation as to the ultimate scope of the Lea committee investigation. There have been suggestions recently that the committee, which has been in touch with the industry's operations for several years, investigate all phases of the governmental administration of petroleum under war conditions. Back of these suggestions is the thought that the committee, after an investigation, might recommend changes in the emergency administration which, if made effective, would end some of the existing restrictions and return many of the regulatory functions back to the states. It is also understood that testimony will be presented at the hearing suggesting important changes in rationing procedure not only for gasoline but for other products. Support for a plan in which administration of all rationing would be taken from OPA and turned over to PAW, is growing.



U.S. Representatives Favor Strong Governmental Control

WASHINGTON.—Representatives of the United States at the Anglo-American conference which got under way here April 18 at the State Department will outline an international oil program which will go much further in governmental control than has been suggested by the petroleum industry, according to reports the first of the week. It is understood that the American representatives will favor governmental controls over all production and refinery operations with marketing quotas in the distribution of products. The foreign-policy committee of the petroleum industry has favored a voluntary commission arrangement which in its application would be similar to the interstate oil compact among the oil states in this country.

The sessions of the American and British representatives may be prolonged and probably somewhat informal, since the groups are primarily advisory to policy committees of cabinet minister rank appointed by both governments to work out a joint world-oil agreement on the basis of the recommendations of the technical experts.

An industry advisory committee of 10 men has been appointed to assist the United States delegation, but because of objections by the Department of Justice that the antitrust laws might be violated these advisers will not be permitted to sit in on the discussions nor to meet formally as a group. Their function is not entirely clear, but State Department officials said they would be called in frequently by the American delegates for information and advice.

The State Department announcement said: "The Department of State announced today that the Senate's special committee on petroleum will be kept informed regarding the course of the preliminary exploratory discussions with the United Kingdom on oil. Moreover, in order that the views of the American oil industry regarding problems that may arise in the discussions may be taken into account, representatives drawn from various sections of the industry have been invited to meet with the group of experts who will conduct the oil discussions for the U. S. Government. In this connection, invitations have been issued to the following: W. R. Boyd, John A. Brown, H. D. Collier, J. Frank Drake, Orville Harden, George A. Hill, A. Jacobson, W. Alton Jones, W. S. S. Rodgers and Ralph T. Zook."

American Plan

It is understood that no attempt has been made to agree on all the details involved in the American proposal for a strong government-controlled oil policy after the war. The broad outline, however, assumes that each nation that becomes a party to the agreement will exercise close control of oil operations of their nationals as they affect the operations of other countries. The U.S.S.R., Netherlands, France, Venezuela, Mexico, and other nations could become parties to the agreement although the plan would function if necessary as an agreement confined to the United States and Great Britain which, through their nationals, will control most of the world's oil after the war.

Under the plan each government would agree to certain restrictions in the operations of its own nationals. Cartel arrangements among companies in the marketing of products and similar activities dealing with other petroleum operations would end and the governments acting through the international commission would prevent undesirable competition and other uneconomic practices.

Poe Urges Policy of Cooperation Between Industry and Government

A PLEA for cooperation between the petroleum industry and the Government which will result in the adoption of a foreign oil policy which will take care of the present and future needs of this country, was made last week in Tulsa by E. Holley Poe, who resigned effective March 15 as vice president and general manager of Petroleum Reserves Corp. Poe was in Tulsa, his former home, for a few days visiting friends before returning to New York City where he will be located.

In the interview at Tulsa, Poe did not comment on the status of the proposed pipe line connecting oil fields in Arabia and Kuwait with the eastern Mediterranean, a project of PRC on which he worked while head of the corporation. He explained that he resigned his position with corporation for personal reasons. Poe was in petroleum war service at Washington about 2 years, serving as director of Natural Gas and Natural Gasoline Division of the Petroleum Administration for War previous to accepting the position as the active head of PRC.

"The formulation of a strong far-seeing petroleum policy for the United States is as inevitable as it is necessary to our national survival," Poe declared. "The influence of industrial rivalry and internal political expediency should have no part in such considerations."

Poe explained that in the development of a national oil policy there two primary considerations. The first objective, he said, should be to provide adequate supplies of petroleum and petroleum products for military and civilian uses now and after the war. The other consideration should be to assure this country a position in the world petroleum economy compatible with our needs and our ability to maintain such a position.

Poe paid tribute to the cooperative work of the Petroleum Industry War Council and the Petroleum Administration for War in connection with the war program. "In the light of this there seems to be no logical reason why such cooperation should not be continued with respect to formalizing a petroleum policy and program to safeguard the future of the nation," Poe said.

"I am well aware that there exists right now some division of opinion within the petroleum industry as to the most feasible approach to our national petroleum problem," Poe declared, "but I have yet to hear anyone advocate that our national interests can be best served if we continue without any policy."

Without mentioning the Arabian pipe-line project by name, Poe said: "One deal does not make a policy and if that deal is inimical to the establishment of a policy then that deal is indefensible."

Relative to the Senate committee hearings on the Arabian pipe-line proposal and other matters dealing with oil operations outside this country, Poe said that the hearings would result in the formation and adoption of a petroleum foreign policy "that will give to the nation and our American nationals the support and protection they deserve.

"If the industry fails to cooperate in determining a sound policy and program, the Government must do it alone. But first industry must be appraised of the scope of the operations in which it is expected to participate. It has always been my feeling that private industry should be encouraged and protected by our Government, and that it should in return respond with willingness and spirit to any opportunity to assist Government."

Research Credited With Solving Problems of Recovery in Nation's Oldest Oil Field

by H. Stanley Norman

COLUMBUS, Ohio. — Problems of producing oil in the nation's oldest petroleum empire were discussed here last week by outstanding authorities in the fields of compression, water treatment and other aspects of secondary recovery. The vehicle for this latest appraisal of operating conditions was the meeting of the eastern district, division of production, American Petroleum Institute, April 13 and 14.

Several papers dealt with operations outside the eastern area, but the high interest accorded speakers on national and international topics proved that eastern operators are just as much concerned with broader aspects of the oil industry as they are with their provincial problems. For example, one of the best-attended sessions featured a paper on developments in the southeastern United States by Hugh Brankstone, geologist, Gulf Oil Corp., Pittsburgh. It dealt with the states from Mississippi to Florida where many operators believe the country's next major oil province will be developed.

V. F. Bowyer, Peoples Natural Gas Co., Pittsburgh, was elected chairman of the eastern district for the ensuing year, succeeding W. E. Ferguson, Ohio Fuel Gas Co., Columbus, who becomes chairman of the advisory committee. Six new vice chairmen are: R. B. Anderson, Columbian Carbon Co., Charleston, W. Va.; J. V. Goodman, Equitable Gas Co., Pittsburgh; I. W. Hartman, Gordon Oil Co., Mount Pleasant, Mich.; R. J. Sullivan, The Carter Oil Co., Mattoon, Ill.; S. M. Vockel, Waverly Oil Works Co., Pittsburgh; J. E. Schaefer, The East Ohio Fuel Gas Co., Cleveland. K. C. Cottingham, Ohio Fuel Gas Co., Columbus, who served as chairman of the general arrangements committee for last week's meeting, was elected secretary-treasurer of the district.

Progress in development of techniques for recovery of roughly 500,000,000 bbl. of crude oil from the Bradford field which will remain after exhaustion of primary and secondary production methods was reported by A. E. Booth, M. D. Booth & Co., Bradford. His paper on "Economic Phases of Secondary Recovery by Water Flooding in the Bradford Field" mentioned many of the developments which are lengthening the life of that oil reservoir. Peak production in the secondary phase of recovery was reached in 1937, when Bradford accounted for approximately 20,000,000 bbl. of crude oil, an increase of 1,000 per cent from the low point in 1905.

Delegates to A.P.I. production meeting were told how the life of the Bradford field is being lengthened. After primary and secondary methods of recovery have been exhausted, 500,000,000 bbl. of crude will remain underground to be lifted by means which it is believed will be devised. High interest manifested in other areas also. A digest of Hugh Brankstone's paper on developments in southeastern states starts on page 40, and short digests of other papers appear on page 68.

"During this second phase of the economic development of water flooding," Booth said, "numerous important steps were taken along the road of progress. Pattern flooding (5-spot, etc.) was introduced, core analysis laboratories were set up, plants for supplying water under pressure were built and intake pressures were stepped up. Water treatment, iron precipitation, filtration and control of acidity came into vogue. It is a rather curious fact that the injection water now supplied by the most up-to-date plants is more carefully conditioned than any city water supply system in the country.

"Coincident with these improved production practices came a marked step-up in the pace of completions, large tracts were rapidly drilled up with 10 or more strings of tools in operation on a given tract. At the same time a major portion of the thick-sand high-oil content sections of the field were the subject of exploitation.

M. G. Gulley, Gulf Oil Corp., Pittsburgh, retiring chairman eastern district advisory committee; R. B. Anderson, Columbian Carbon Co., Charleston, W. Va., new vice chairman eastern district; Kenneth C. Cottingham, Ohio Fuel Gas Co., Columbus, new secretary-treasurer eastern district; V. F. Bowyer, Peoples Natural Gas Co., new district chairman; W. E. Ferguson, Ohio Fuel Gas Co., Columbus, retiring district chairman and new chairman advisory committee; E. V. O'Rourke, professor of petroleum engineering, Ohio State University, member advisory committee

J. E. Schaefer, East Ohio Gas Co., new vice chairman eastern district A.P.I., and J. C. Askam, The Ohio Oil Co., Findlay, Ohio, member advisory committee

"The peak year of production under water flooding also proved to be the peak for well completions, totaling 4,111 for a monthly average of 342. But, to my astonishment, it was stated in Fettke's book on the Bradford field that in 1881, the peak year for natural production and also the all-time peak, likewise witnessed the peak of completions—460 wells per month, or approximately 5,500 wells for the year. Thus the stage was set for the third or what may be called the mature phase of water flooding."

Booth then outlined some of the production techniques which offer possibility of economic recovery of much of the oil remaining in the Bradford sand. He credited development of current practices to research, which, he said, would be continued. He said research had tremendously stimulated interest in coring, and had prompted publication of a brochure on treatment of water for injection that is without a peer. Research had aided in use of wider spacing and higher pressures and had brought out the original suggestion from which developed the present method of selective shooting. Booth presented a typical shot plan to illustrate the application of selective shooting in which the concentration of glycerin opposite the various layers of sand is inversely proportional to the permeabilities.

"Probably the most important single item," Booth declared, "the one with the greatest chances of substantial improvement in the economic picture of water flooding, is the increased recovery of the residual oil content of the sand. This is being approached directly through better water conditioning and higher pressures, accompanied by higher average velocities for the water front, together with coring and selective shooting."

Recent experiments and laboratory studies, Booth said, indicate that chip cores will furnish required information on grain size, fossils, etc., and that this method of coring is the least expensive of three types generally used in Bradford.

"There is another group of economical practices that directly affect the production cost," Booth explained, "and indirectly permit of increased recovery, concerned principally with completion equipment and pumping operation of the wells. One recent experiment in completion practice consists of filling the annular space between the tubing and wall above the packer, in water intake holes, with a bentonite mud well up into the water string and then removing the 6¼-in. water string for reuse in another well. The mud prevents interchange of water between strata, seals permeable strata against loss of gas from adjacent oil wells, and at the same time keeps the hole open for reentry in case of need for repairs. This practice was inaugurated as a means of saving pipe in the war effort, but has worked out so satisfactorily that it will be continued."

Among other practices currently receiving attention of operators in the Bradford field, Booth said that individual electrically driven jacks, equipped with automatic time controls and protected against lightning, out-of-phase and overload, are effecting substantial savings in power consumption. He added that gas-tight steel tankage, buried lead lines and gas-tight separators would save approximately 100 cu. ft. of 1,500 to 1,800 B.t.u. gas per barrel of oil. He advised against use of live steam in heating tanks of oil because of the waste and suggested, instead, construction of gas-tight tanks on a concrete ring which would afford sufficient clearance for heating the under side of the tanks in cold weather and thus avoid dissipation of the valuable hydrocarbons.

Additional studies are being made of the volumetric efficiency of pumping valves which may lead to a change in design for greater economies in operation, all of which contribute substantially to the profitable recovery of residual crude from the Bradford reservoir.

Cecil Boord, department of chemistry, Ohio State University, concluded in his paper on "Present and Future Trends in Motor Fuels" that the world's motor fuel supply must be judged adequate for many years. He held that the motor fuels of the future will be saturated and unsaturated, cyclic and noncyclic, paraffinic, olefinic, naphthenic and aromatic. The cost per gallon, he said, may be greater, but the octane number will be in the general vicinity of 100.

Sidney A. Swensrud, vice president, Standard Oil Co. (Ohio) Cleveland, presented a paper on the desirability of converting the War Emergency Pipelines, Inc.'s big-inch lines to natural-gas transmission service after the war ends or earlier if conditions permit. He presented cost data showing that at load factors ranging from 70 to 85 per cent of capacity, the lines could deliver natural gas to the eastern seaboard area for 22.8 to 26.1 cents per 1,000 cu. ft.

L. G. Huntley, Huntley & Huntley, Pittsburgh, consulting geologists, presented a paper on "Oil Around the World." He gave thumbnail summaries of various foreign producing countries, telling briefly about their mineral laws. He concluded in practically all instances that restrictive laws were the chief deterrents to more intensive development in the less completely explored and exploited producing countries. Huntley called attention to favorable producing conditions within a few miles of Chunking, China, which he said have not been explored. He referred to the Red basin in Szechuan Province, where it is estimated more than 100,000 wells have been drilled in the last 1,000 or so years, chiefly for brine. He said that natural gas was found in some of the wells and that it is used as fuel in evaporating the brine. Two of four wells drilled to 4,000 ft. hit oil. They are the two drilled farthest down the plunge of the anticlinal nose and give reason to believe that more important oil will be found as the lead is followed in the sands on top of the marine beds. Huntley told how restrictive laws had delayed development in Peru, Colombia, Argentina, Mexico, Bolivia and said national jealousies had prevented intelligent petroleum exploration in France and several other European countries.

THIS WEEK

INTERNATIONAL—Intergovernmental control of world's oil reserves and markets sought by U. S. representatives at Anglo-American conference in Washington. . . . Designed to eliminate national and international cartels by private companies. . . . Would embrace all oil-producing countries. . . . Companies would operate within rules established by intergovernmental commission, which would fix production quotas, preserve orderly marketing practices, etc. . . . Enforcement would rest with governments themselves. . . .

DRILLING—Naval appropriations bill passed by House includes $1,000,000 for exploratory drilling in Navy's Alaskan oil reserves. . . . Appropriations committee regarded project as "shot in the dark," but approved on ground there was no other way to find out whether there is oil there. . . . Heard testimony that moving oil out of Point Barrow would be simple compared with War Department's $130,000,000 Canol project. . . . ¶PAW indicates quota for drilling wells this year may have to be cut from 24,000 to 20,000 owing to manpower and materials shortage. . . . ¶Relaxing federal restrictions on drilling probably would result in 700 more Illinois wells, S. F. Peterson, state division of oil and gas conservation, tells Illinois investigation commission. . . . Removal of drilling restrictions in Indiana, Kentucky, Michigan, and Illinois would yield oil to utilize 40,000 bbl. daily refining capacity in Illinois now idle. . . .

RATIONING—Hope for increased gasoline ration for B card holders vanished with announcement of OPA that survey showed no increases warranted anywhere. . . . ¶PAW tightens curb on use of naphtha as motor fuel. . . . Dealers sell it in cans marked "Not for use in motors"; motorist drives around corner and empties can into his tank. . . . ¶Ickes says whole gasoline-rationing program jeopardized by black-market operations. . . . Over 2,500,000 gal. of gasoline thus removed daily from lawful uses. . . . Fifty per cent of coupons in some localities counterfeit. . . . ¶Special House interstate commerce subcommittee on petroleum problems preparing this week to probe black markets with view of drawing up remedial legislation. . . .

PRODUCTION—New producing sand discovered by Continental in San Miguelito field, flowing 1,558 bbl. first 24 hours. . . . Best well in Mississippi, flowing 1,000 bbl. first 24 hours, completed by Gulf in Heidelburg pool. . . . ¶Conference of all purchasers of Permian basin crude called by PAW with view of working out equitable distribution of allocated production in West Texas. . . . Demand for West Texas crude has grown since completion of Stanolind pipe line from Slaughter pool to Cushing, Okla. . . . ¶Just three times as many discoveries recorded in Texas as last year. . . . Exact figures: 51 wildcat producers so far in 1944, against 17 in same period last year. . . . ¶Survey of East Texas field reveals average bottom-hole pressure of 1,008.5 lb., an increase of 5.03 lb. over March. . . . Field produced 11,600,000 bbl. in March. . . .

FOREIGN—United States to discuss oil problems with Russia, Netherlands, and Latin-American countries following Anglo-American conference in Washington. . . . ¶Two subsidiaries of Standard Oil Co. (New Jersey) awarded total of $16,201,688, plus interest, for properties seized by Mexican Government. . . . ¶Rich oil deposits found in Shugarov Raion, Tatar Republic, U.S.S.R. . . . Estimates of potential daily production range 70,000 to 140,000 bbl.

THE LIFE HISTORY OF A TYPICAL COUNTERFEIT GAS COUPON SOLD TO A CAR OWNER

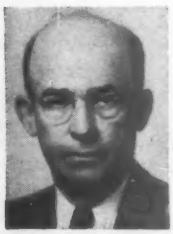
The ultra-violet lamp affords one method of detecting counterfeit gasoline coupons, with which the country has been flooded. When the deposit sheet here illustrated was held under an ultra-violet lamp the genuine coupons glistened, but four counterfeits turned black. Chlorox, a common household bleaching agent, rubbed on the back of the paper, brings out the invisible watermark if it is a genuine coupon, issued by the Government

Panel of experts at "information please" session face D. E. Buchanan, Hanlon-Buchanan, Inc., (not in photograph) presiding as interlocutor: Floyd McGown, National War Labor Board; P. M. Raigorodsky, Petroleum Engineering, Inc.; Dr. G. G. Brown, University of Michigan; John Ford, M. W. Kellogg Co.; P. S. McGruder, General Petroleum Corp.; Henry Wade, Parkhill-Wade; E. O. Bennett; R. B. Cragin, Refining Division, PAW; A. J. L. Hutchinson, The Fluor Corp.; M. H. Kotzebue, Gasoline Plant Construction Corp.; James E. Pew, Natural Gas and Natural Gasoline Division, PAW; Frank Dotterweich, PAW

New Techniques and Postwar Trends Featured by N.G.A.A.

by Paul Reed

DALLAS.—The status of large operations, greatly expanded during the war, was reflected in the variety of material featured at the annual meeting of the Natural Gasoline Association of America which met here April 12-14. Techniques of promise and adjustments to be anticipated for the postwar period were discussed from several angles in papers delivered and in the "information please" session.



M. H. KOTZEBUE

Selection of M. H. Kotzebue, chief engineer and manager, Gasoline Plant Construction Corp., for the honor of receiving the Hanlon Award, was gratifying to men throughout the industry as recognition of his accomplishments.

In taking stock of the natural-gasoline industry, which expanded facilities from a prewar output of 140,000 bbl. daily early in 1940 to an output of 259,000 bbl. in February 1944 and which may be increased to 320,000 bbl. daily by the end of this year, several speakers dealt with postwar prospects of both natural gasoline and liquefied petroleum gases. James E. Pew, director of the Natural Gasoline Division, Petroleum Administration for War, suggested a cooperative arrangement among plants when marketing conditions become more difficult after the war. In this way, he said, production may be pooled and converted to a usable product at some central plant. Facilities at such a centralized plant would make good motor gasoline and other useful products to be sold at prices above the prewar levels for natural gasoline.

Commenting on the vitality of the natural-gasoline industry, Pew said he knew of no other business which had achieved an increase in wartime output as high as 129 per cent without any government financial aid. The gas-cycling phase of the industry, he said, had expanded proportionately more than the natural-gasoline phase. Current output of 70,000 bbl. daily is expected to rise to 116,000 bbl. late in the summer when a total of 39 plants, some now under construction, will be operating. Three or four additional plants are being planned. Pew anticipates no particular postwar problems for cycling plants. Most of them now have leading plants. Their facilities for producing large amounts of products could be converted, with certain minor changes, to make a good motor gasoline more cheaply than could be done in a refinery.

The national butane balance will not be much changed by construction for new processes during the war, according to D. P. Barnard and J. H. Forrester, Standard Oil Co. of Indiana, in "How Will New Refining Processes Affect the Postwar Light End Situation?" They predicted that new consumption will exceed the new production, but not sufficiently to make possible utilizing all recoverable butanes for purposes other than fuel. No great change in average front-end motor gasoline volatility is to be expected from the various combined factors.

In the panel discussion on the last day, under conditions providing that no one would be directly quoted, it was stated that as the war continues there will be a growing demand for improved quality of 100-octane gasoline for the Army and Navy, which means all isopentane and isobutane will be needed in aviation gasoline. This statement was made to emphasize that war refining problems must be disposed of before postwar ones.

The significance of new-equipment developments, discussed by E. O. Ben-

Attendance records of the annual N.G.A.A. meeting were broken with registration of 619. Papers published in The Oil and Gas Journal are as follows: "Symposium on the Future of Liquefied Petroleum Gas," presented by G. L. Brennan, Warren Petroleum Corp., April 13, page 282; "Unitization of Condensate Pools," Roy L. Benoit, Ohio Oil Co., April 13, page 297; "Informal Review of Development and Economics of Natural Gas Cycling Operations," J. M. Flaitz, Distillate Production Corp., page 46 in this issue; "Management Considerations for Gasoline Plant Design," W. F. Matheny, Phillips Petroleum Co., will appear in an early issue.

nett in "Centrifugal Compressors and Their Application in Natural Gas and Natural Gasoline Operations," was commented upon widely. A centrifugal compressor unit driven by a gas-fired turbine would have mechanical simplicity, and exhaust from the turbine could supply heat for processing.

Dr. A. O. Beckman, National Technical Laboratories, in "Hydrocarbon Analysis With Infrared Spectrophotometer," described methods already in use by a few natural-gasoline organizations. Beckman explained that analysis of petroleum hydrocarbons has been speeded and simplified by the development of a new instrument, infrared spectrophotometer. Mixtures of petroleum gases, both simple and complex, which formerly required hours of careful laboratory work for analysis, can now be analyzed in a few minutes, with an accuracy often exceeding that afforded by other methods. The spectrophotometer is not only used for manual tests but has been adapted for automatic process control, particularly in butadiene plants.

In the panel discussion it was stated that analyses could be made with the infrared spectrophotometer at one-tenth the cost of the mass spectrograph method and that complexity of the procedure was reduced in the same proportion.

Discussing "Condensate Gas Sampling," Dr. George Granger Brown, of University of Michigan, presented results of work done by himself and Dr. D. L. Katz, with the cooperation of the industry in the Katy field, Texas, in testing various devices and methods in use for sampling condensate wells. A well was equipped with a full-scale separator, vertical and horizontal meters on the wet gas, and facilities for enriching the wet gas so that it might contain up to 20 per cent by volume of liquid or 13 g.p.m. in the 2-phase flowing stream. These rich mixtures could be maintained for only a few minutes at a time.

Within the limits of the test conditions no differences in the vertical and horizontal meters could be detected. Both gave results accurate within 2 per cent, with up to 5 per cent by volume of the total stream in the liquid phase, corresponding to about 3 g.p.m. in this stream. With increasing liquid content both vertical and horizontal meters indicated somewhat higher gas rates than were correct. The correct gas rate was taken as the standard cubic feet of gas of the entire stream when in the gaseous state.

It was found that properly designed centrally located sampling tubes in a straight section of pipe, either horizontal or vertical, could be relied upon to give satisfactory results within about 2 per cent of the full-scale separator when used under certain conditions. The variables that must be controlled are the design and size of the sample tube and tip, the diameter of the pipe, the rate of flow through the sampling section and the rate of flow through sampling tube or tip.

The best design and the proper conditions of operation for all practical conditions have not yet been determined. Test equipment was described in "Problems of Condensate Production Studied by Gulf Coast Operators," by E. H. Short, Jr., The Oil and Gas Journal, September 9, 1943, page 40.

Effect of variations in pressure, temperature and particularly sampling rate on the results obtained in measuring the liquid produced from gas-condensate wells was discussed in a paper presented by Kenneth Eilerts, of the Bureau of Mines. At the request of the Petroleum Administration for War the bureau has been making a survey of gas-condensate reserves in the Gulf Coast area.

Among questions stimulating active discussion in the "information please" session was one regarding the limit of pressure on absorption operations. Following an assertion by one engineer that there was not limit to such high pressures, another engineer stated that pressure had been limited in his experience by economic conditions to 2,000 lb. Absorption operations at 1,800 lb. pressure required 20 hp. to operate lean-oil pumps for every 56 hp. for operating compressors (approximately one-third). Oil of greater molecular weight is needed for absorption at high pressures. For 37° A.P.I. oil, 207 molecular weight is needed. Experience with such an oil—496° F. initial boiling point, 670° F. end point, with the 50 per cent point 542° F.—was cited to point out that carryover at 1,400 lb. was 0.0004 gal. per 1,000 ft. of gas; at 1,900 lb., 0.0047 gal.; at 2,300 lb., 0.0082 gal.

The report of the technical committee, presented by M. R. Church, Shell Oil Co., Inc., mentioned that the fractional distillation project, of which H. A. Montgomery is chairman, seeks to improve reproductibility of low temperature fractional analysis as conducted by different laboratories.

In the project for studying simple operating tests for treating control of liquefied petroleum gases derived from gas containing hydrogen sulfide and mercaptan sulfur, of which L. A. Boyd is chairman, experiments have indicated need for correction of test bombs which is now being studied.

Satisfactory progress was reported in studies of Henry Beeson working with C.N.G.A. on joint standard tables of physical constants for paraffin hydrocarbons. T. W. Legatski is chairman of a committee to study specifications and test methods.

All officers of the association were reelected as follows: James W. Vaiden, Skelly Oil Co., Tulsa, president; H. H. Beeson, Sabine Valley Gasoline Co., Shreveport, La.; R. A. Carter, Continental Oil Co., Ponca City, Okla.; H. A. Ells, Cities Service Oil Co., Bartlesville, Okla., and C. R. Williams, The Chicago Corp., Corpus Christi, Tex., vice presidents, and William F. Lowe, Tulsa, secretary-treasurer.

The Natural Gasoline Supply Men's Association, meeting concurrently with the N.G.A.A., elected A. M. Buxton, Cooper-Bessemer Corp., president; F. J. Wetzel, Ingersoll-Rand Co., and R. E. Walker, American Rolling Mill Co., vice presidents, and John Heinzerling, Vinson Supply Co., treasurer. All are from Tulsa.

Directors elected to serve a 2-year term are: L. S. Allen, National Tank Co.; Roy Bush, Merco Nordstrom Valve Co.; L. D. McKay, Union Steam Pump Co., and Heinzerling, all of Tulsa, and H. M. Rosevear, Wyatt Metal Works, Dallas, Tex.

Officers of Natural Gasoline Supply Men's Association: R. E. Walker, American Rolling Mill Co., second vice president; John Heinzerling, Vinson Supply Co., treasurer; A. M. Buxton, The Cooper-Bessemer Corp., president; Fred J. Wetzel, Ingersoll-Rand Co., first vice president; and W. F. Lowe, secretary

Knox Asserts Government Offered to Buy Rights of Companies in Arabia

by Henry D. Ralph

WASHINGTON. — Some new light was thrown upon negotiations leading to the Arabian pipe-line proposal when Navy Secretary Frank Knox, testifying before the House appropriations subcommittee, disclosed that at one time the Government offered to buy the rights of American oil companies in Arabia.

"I am told by oil men that the greatest known pool of oil in existence is that in the Persian Gulf area," Knox said. "Some of our American companies got in on a part-ownership basis, but they were in an agreement, so I am told, under which the British controlled where the oil goes. They do not have the right to sell in a free market."

At first the British were not interested in oil prospects in Saudi Arabia, Knox said. "At that point, the American companies got interested, notably Standard of California, the Texas and Gulf Oil companies. They discovered the pool of oil currently estimated at 20,000,000,000 bbl., obtained a concession from the Saudi Arabian Government to operate under royalty payments.

"They were not able to operate to any extent at all, I suppose, but they made some prepayments to the Arabian Government in anticipation of royalties running up to several millions of dollars," the secretary said. "The Arabian Government at the same time was, I believe, calling on the British for help and they advanced considerable sums of money.

"Eventually the American companies became alarmed over the situation. There they were, private interests wholly, with no support from their own Government, in possible competition with the British Government and with the British companies having all the support and prestige that the British Government could bring. They came to us in a state of concern and urged the American Government to protect these American owned deposits. The proposal was put up to the Joint Chiefs of Staff and they approved the idea generally."

Discussions between the State, War, Navy, Interior departments and FEA and Standard and the Texas Co. began with a government proposal to buy out the private interests in Saudi Arabia. The oil companies turned that down, and later declined a 50-50 ownership proposal.

"Finally," Knox said, "we got down to a discussion of a third ownership by the United States." At that time, the Government was dealing only with Standard and the Texas Co.

"The proposal was made that we buy a third interest on the general theory of repaying to the two companies just what the third interest would cost them. I think that at that time there was considerable pressure brought on these two companies not to let the Government buy in. There was a sense of alarm among the oil people that the Government was going to get into the oil business. Negotiations collapsed."

The Government then made plans to build some refineries in the area, but not in the field under consideration. Negotiations were reopened on the basis of building a pipe line from the Persian Gulf to the Mediterranean.

The pipe line, a 24-in. line with a 300,000-bbl. per day capacity, will be open to everyone as a common carrier. It will protect American ownership in the concessions, Knox said, because "if the United States Government was vitally interested in this field, nobody is going to come in or take the concessions away."

Naval Appropriation Bill Includes $1,000,000 for Exploration in Alaska

WASHINGTON. — The House this week passed a Naval appropriations bill which included a million dollars for exploratory drilling in the Navy's Alaskan oil reserves, but passed over items included for the Elk Hills reserve, pending legislation on the Navy-Standard Oil Co. unit plan contract.

Present plans for Alaskan exploration, Secretary Knox told the House appropriations committee, call for drilling six wells, the work to be done by Seabees. The Alaskan project admittedly has little or no connection with the present war, and, Secretary Knox said, if oil is found in the area it will probably be left there for a long while. A small exploration party is now in the field, and the Navy hopes to send a drilling party, with a rig capable of going to at least 10,000 ft., to the vicinity of the Cape Simpson oil seeps this summer. This will have to be done in August and September, while waters in the Point Barrow area are ice free for shipping. Drilling operations can continue virtually the year round.

The appropriations subcommittee refused Navy's request for $1,670,000 to be used on Naval Petroleum Reserve No. 1 (Elk Hills). This included $275,000 for shutting in of production wells in event of condensation, $717,835 for purchase of leasehold interests and operating equipment, and $677,165 for payment due to Standard Oil Co. of California under the present temporary operating agreement. Action on these will await the recommendations of the Committee on Naval Affairs, currently considering legislation to legalize the Navy-Standard contract.

A total of $50,000 was granted for normal operations at the Elk Hills field.

This bill (S. 1773), designed to legalize the pending Navy-Standard contract, was discussed in the House late last week by Representative Vinson (Georgia), chairman of the House naval committee.

Advocating condemnation proceedings in the Elk Hills area, Vinson charged that the Navy-Standard contract is an attempt to use the war as a pretext for exploiting and developing oil in the reserves, and that the contract will strip the Congress of all its control over the Elk Hills resources.

"I do not agree that one single cabinet officer ought to be permitted, whatever his pretext, to enter into any contract for the development of these reserves," Vinson said. "That is the issue."

FOUNDED IN 1910

BY PATRICK C. BOYLE

the OIL AND GAS JOURNAL

Anglo-American Plans

THE Anglo-American conference under way at Washington can quickly lead to the adoption of sound petroleum policies of importance to petroleum operators everywhere and of controlling significance in the plans to establish an equitable world economy as a basis for a prolonged peace. At the other extreme is the possibility of more confusion with international complications that would nullify the peace aims of the English speaking people.

As the discussions start there are reports that representatives of this country will suggest a powerful international authority, centering in the two governments, with what will amount to control over private oil operations, extending from concessions and leases to the marketing outlets.

This program, as outlined, goes much further than the recent proposal of representatives of the petroleum industry in this country who favor voluntary agreements among nations and among operators patterned after the interstate oil compact. In this connection it is a sad commentary on the war policies of the Washington administration that, because of antitrust law restrictions, the petroleum representatives here serve only in an advisory capacity in the discussions while British oil interests are represented directly.

The need for a common understanding between Great Britain and the United States is apparent to everyone familiar with petroleum developments outside this country. Except for the U.S.S.R. and the oil properties temporarily in the hands of the enemy nationals of the two countries and Netherlands control all but a few per cent of the world's petroleum.

A great deal has been said in recent weeks concerning the competitive position of the two countries as regards oil. Much also has been made of ownership by the British Government of a majority interest in the company operating in Iran, but the fact that most of British oil comes from private operations is overlooked.

So far as competition is concerned, the nationals of the two countries and Netherlands for years have produced and refined petroleum in large quantities in adjoining operations located in South America, Mexico, the West Indies, East Indies and other countries. They have shared markets in all parts of the world.

American operators recently have found large oil reserves in the Middle East, an area where British interests have been the largest oil producers and refiners for many years. There is no fundamental condition there which should preclude private operation of these adjacent oil properties, which are to play a principal role in the future development of the Eastern hemisphere, in accordance with the peace aims of the Allies.

It is fortunate that the Anglo-American discussions are being held simultaneously with the hearings of the Senate petroleum policy committee. The program of this committee has expanded from an investigation of the Arabian pipe-line project to the adoption of a foreign oil policy for this country, and that is as it should be.

This creates a condition in which responsibility for a workable program rests not with the appointed administrative committee, but with a legislative branch of the Government to which, by Constitutional provision, the final decisions in foreign policy have been delegated. The petroleum industry in this country should insist at this critical period on presenting its case in full before representatives of the legislative body.

PAW Passing on 200 Requests For Deferments Per Day

WASHINGTON.—Requests for draft deferment of key technical men under 26 years of age in the crude production and 100-octane refining branches of the oil industry are being passed on at the rate of a couple of hundred per day by a special committee of the Petroleum Administration for War.

This new deferment procedure was authorized by the War Manpower Commission and Selective Service headquarters only on April 11, but PAW was prepared to act promptly and scores of personnel managers had already submitted their requests. All others were asked to do so at once since local draft boards are moving rapidly to induct all able-bodied men under 26 and occupational deferments in this age group are requested by state Selective Service directors only on certification by appropriate government agencies.

PAW manpower experts estimate that there are about 140,000 men employed in the aviation-gasoline and synthetic-rubber components programs, of which 2,600 are under 26. Of 150,000 men engaged in exploration and crude-oil production, about 4,000 are under 26. Of this total of 6,600 men under 26 in these two branches of the oil industry approximately one-third may be classified as technical men as defined by Selective Service regulations, but by no means all of these 2 200 technical men are eligible for deferment under the new procedure. Very limited criteria have been set up for men under 26 and possibly less than half will be deferred, though probably the ratio will be higher in the 100-octane and synthetic-rubber programs than in exploration and production.

No special consideration is being given other branches of the oil industry at this time. The War Manpower Commission Inter-Agency Committee on Occupational Deferments, after more than a week of deliberation, recommended deferments for only these two branches, and their recommendation was adopted by Selective Service.

This procedure covers men under 26 engaged in (a) aviation-gasoline program and synthetic-rubber components; (b) technical services vital to aviation-gasoline program and synthetic-rubber components, and (c) special technical services essential to production of crude petroleum.

To obtain deferments, company officials must submit three copies of Selective Service Form 42-A (Special) for each employe to the office of the PAW labor counselor, together with a statement from a responsible company official certifying that each man for whom deferment is asked comes within the criteria for exemption. If approved by the PAW committee, the 42-A and recommendation is sent to the state selective service director who is authorized to recommend that the local draft boards grant deferment.

If the company certifications and 42-A's are properly filled out in detail the PAW officials have little difficulty in determining which deferment requests are the most urgent and the most essential to the war program. They know the nature of the work coming under each job description, the amount of technical training involved, and the difficulties of replacement; they also know the current activities of each company and the status of its war products production schedule; and they also have each company's manning table showing the number technical men subject to draft call and the possibilities of replacement with trainees.

Continental Finds New Sand In San Miguelito Field

LOS ANGELES. — Continental Oil Co. has discovered a new producing sand at its 31 Grubb, in the San Miguelito field, Ventura County. Production of 1,558 bbl. of 31-gravity oil in the first 24 hours, was from 7,150 to 8,259 ft. Continental has 1,050 acres under lease, with 30 wells producing from a sand between 6,377 and 7,923 ft.

DEATHS

Lee E. Phillips, 67, who, with his brother Frank, founded Phillips Petroleum Co., died April 16 in Bartlesville, Okla. Born on an Iowa farm, Phillips went to Bartlesville in 1905. There he and Frank organized City Bank & Trust Co. His attention turned to oil soon afterward, though he retained his banking interests. He became a director of Federal Reserve Bank of Kansas City and was president of Oklahoma Bankers Association 1915-17. He was offered the post of governor general of the Philippines under President Hoover, but rejected it.

Edwin H. Shonk, 69, active in oil development of the Kanawha Valley, died in Charleston, W. Va., April 8. He was manager of Shonk Land, which owned about 28,000 acres of what is now the Cabin Creek oil field.

George W. Lane, 80, veteran oilfield worker who went to Bradford, Pa., as a young man and took part in the early development of that area, died in Bradford April 8.

John A. Herrington, 61, for 15 years engaged in engineering research work for Hughes Tool Co., Houston, died April 9. He had received degrees from Texas A. & M. College, Cornell University, and University of Wisconsin, and for 10 years was an instructor at Texas A. & M.

R. E. Stone, of Liberty, Tex., surveyor for Magnolia Petroleum Co., met death by drowning April 11 while swimming in the Elm Fork of Trinity River, northeast of Denton, Tex.

Henry F. Pratt, retired sales engineer, graduate of Stevens Institute of Technology and formerly with Pure Oil Co., Newark, N. J., and New York, died April 10 at his home in Millburn, N. J.

Lawrence C. Hollaway, 72, retired production foreman of Goose Creek, Tex., died April 11 in a Houston hospital.

William B. Slaugenhoup, 42, of Sligo, Pa., died in a Pittsburgh hospital April 8. He was service-station manager for Pennsylvania Refining Co. until he entered war service in August 1942. He was discharged in May 1943.

Arch B. Hubbard, 58, for 25 years in the sales department of The Texas Co., died April 11 in Abilene, Tex.

Harry F. Wright, 56, petroleum geologist and engineer, died April 15 at his home in Tulsa, where he had resided since 1914, when he helped to establish the geological department of the old Gypsy Oil Co., now Gulf Oil Corp. A son, James M. Wright, graduate of the University of Tulsa school of petroleum engineering, which Harry F. Wright helped to organize, is an instructor at Iowa State College.

Harry M. Cochran, 89, retired district superintendent of South Penn Oil Co., died April 13 in Coraopolis, Pa.

Robert Watchorn, 86, vice president of Union Oil Co., and a former commissioner of immigration at New York, died April 13 in Redlands, Calif. He was born in England, and on coming to this country worked first as a coal miner.

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ARC WELDING

Geological Developments in the Southeastern Gulf Coastal States

*by H. R. Brankstone**

WILDCAT drilling in Mississippi, Alabama, Georgia, and Florida during the year 1943 has added greatly to the available geological knowledge of this territory. The total area of these four states is 211,277 sq. miles compared to 307,807 sq. miles in Texas and Louisiana, but the area of most geological interest to oil men is a band of country 120 miles wide, lying parallel with the Gulf and extending southeast from the Mississippi River to the southern tip of Florida.

Wildcat drilling in Mississippi, Alabama, Georgia and Florida during 1943 has added greatly to the geological knowledge of the area. The author gives a generalized history of the oil development, together with a discussion of the regional structural and stratigraphic relationships. This article is a slightly abbreviated version of a paper that was presented before a meeting of the Eastern District, A.P.I. at Columbus, April 13-14.

Review of Known Oil or Gas Fields

Wildcat drilling in Mississippi had discovered, up until the end of 1942, five accumulations of oil or gas. The first was the Amory gas field which was discovered in 1926. This was followed by the Jackson gas field, Tinsley, Pickens and the Carey field.

The Amory gas field is located in the northeastern corner of the state near the west, or southwest end of the Warrior coal basin. Gas is being produced from shallow wells in the Hartselle sandstone of Mississippian age. Considerable quantities of gas for local domestic use have been produced. The discovery was not sufficiently important to attract additional development.

Four years after the discovery of the Amory gas field, the first well at Jackson was drilled. Sands in the Selma chalk, of Upper Cretaceous age, produced gas. Drilling progressed rapidly, and at present the field covers approximately 7,500 acres. There are 1,500 ft. of closure on top of the Selma chalk and formations are structurally affected for miles in each direction. Initial productions in the field ranged from 1,000,000 cu. ft. to 55,000,000 cu. ft. with pressures between 1,000 lb. and 2,000 lb. per sq. in. The structure is of igneous origin and igneous rock is found below the Selma chalk in the highest part of the field. The Jackson structure is a regional feature and, although a number of dry holes have been drilled outside of the gas field, there may still be local accumulations of oil or gas on the flanks.

Union Producing Co. drilled the discovery well in the Tinsley field late in 1939. The pay horizon was the Woodruff sand of Selma age. This horizon is a sandy tongue of the Selma chalk and is correlated with the gas horizon of the Jackson field. There have been 359 wells drilled in the Tinsley field and a total of 9,840 acres has been proved. The cumulative production at the end of 1942 was 47,000,000 bbl. from six pays in the Selma, Eutaw and Tuscaloosa formations of the Upper Cretaceous.

Structurally the Tinsley field is a faulted dome. The producing sands range from 10 ft. to 20 ft. in thickness and not all of the six sands known are found in each of the wells drilled. This is due partially to complicated faulting and sand conditions.

The development of good production in the Woodruff sand encouraged deeper drilling and, as a result, four additional sands were discovered in the Eutaw and one producing sand in the upper Tuscaloosa. The Eutaw sands produce from an average depth of 5,600 ft. to 5,700 ft. and are known as the Perry, Stevens, Johnson and Lammons sands. One producing sand, known as the Powell, was discovered in the Tuscaloosa. The deepest wells in the field have drilled only into the upper part of the Tuscaloosa.

The Pickens field in Madison and Yazoo counties was discovered in 1940. Production was found in the Wilburn sand of the upper Eutaw. The pay here correlates with the Perry sand of the Tinsley field. The accumulation of oil and gas was controlled by faulting, which interrupted the regional south and southwest dip of the beds to form an oil trap. Wildcat drilling at some distance from known production soon developed two productive areas of accumulation and, at present, the Pickens field is 4½ miles long by ½ mile wide. Approximately 2,000 acres are proved and the field is outlined by dry holes. Forty-five wells have been drilled, of which 10 are dry. Thirty-three wells were producing at the end of 1943, making a daily average production of 6,200 bbl.

The Carey field is in Sharkey County. The discovery well was drilled by British American Oil Co. and completed in October 1941, with an initial production of 35 bbl. of 24.4° gravity oil. Production was found in a sandy limestone of Selma chalk age. Seven tests have been drilled in the area, of which only two are producing at the present time.

The field is situated on a small local structure associated with the east flank of the Sharkey County High. Drilling, so far, has not outlined the areal extent of the structure. Stratigraphic irregularities are found, since Selma chalk is resting on red beds that may be Trinity-Lower Cretaceous in age. At the end of this year only one well was producing an average of 45 bbl. per day.

109 Tests in Mississippi

During 1943, there were 109 tests drilled in Mississippi. These tests drilled a total footage of 572,079 ft. and the figure includes all wells, whether they be wildcats, producers, or salt-water disposal wells. For the purpose of this paper, 76 of these wells are considered to be wildcats. Seven wells were completed in the Flora field, although only the discovery well was completed as a producer. The six additional wells were dry holes and are wildcats. In the Pickens field, 29 wells were completed. These were close in to the field and many were extensions, so that all of them are included under the heading of development tests and have not been included as wildcats. At Tinsley, three wells were drilled during the year. One test was a producer and the other two were shallow tests to the Wilcox for the purpose of salt-water disposal.

Drilling in 1943 was limited to the counties in the south two-thirds of the state. In Yazoo and Madison counties, drilling was concentrated, due to development in the Pickens field. Of all

*Gulf Oil Co.

tests drilled that year, 30.9 per cent tested below a depth of 6,000 ft., 69.1 per cent were completed above this depth. The average depth of wells during the year was 5,257.6 ft. The 76 wildcats drilled an average depth of 5,732.4 ft. This is an increase over 1942 when 60 tests drilled an average depth of 5,276 ft. A wildcat well to a depth of 11,000 ft. will cost approximately $150,000. A producer in the Pickens field will cost, on an average, $35,000. It is estimated that the 76 wildcat tests drilled in Mississippi in 1943 cost approximately $4,500,000.

Geophysical work was carried on in 45 counties in the southern two-thirds of Mississippi during 1943. Forty-six geophysical parties participated, as compared with 40 parties in 1942. Drilling on geophysical prospects indicates that there are several types of structure present in southern Mississippi.

It is known that both deep and shallow salt-dome structures are present in the Mississippi Salt Dome basin. Geophysical data indicate that they will occur at random. They may cover a large or small area and the salt, which has uplifted the formations, may be close to the surface or at depth.

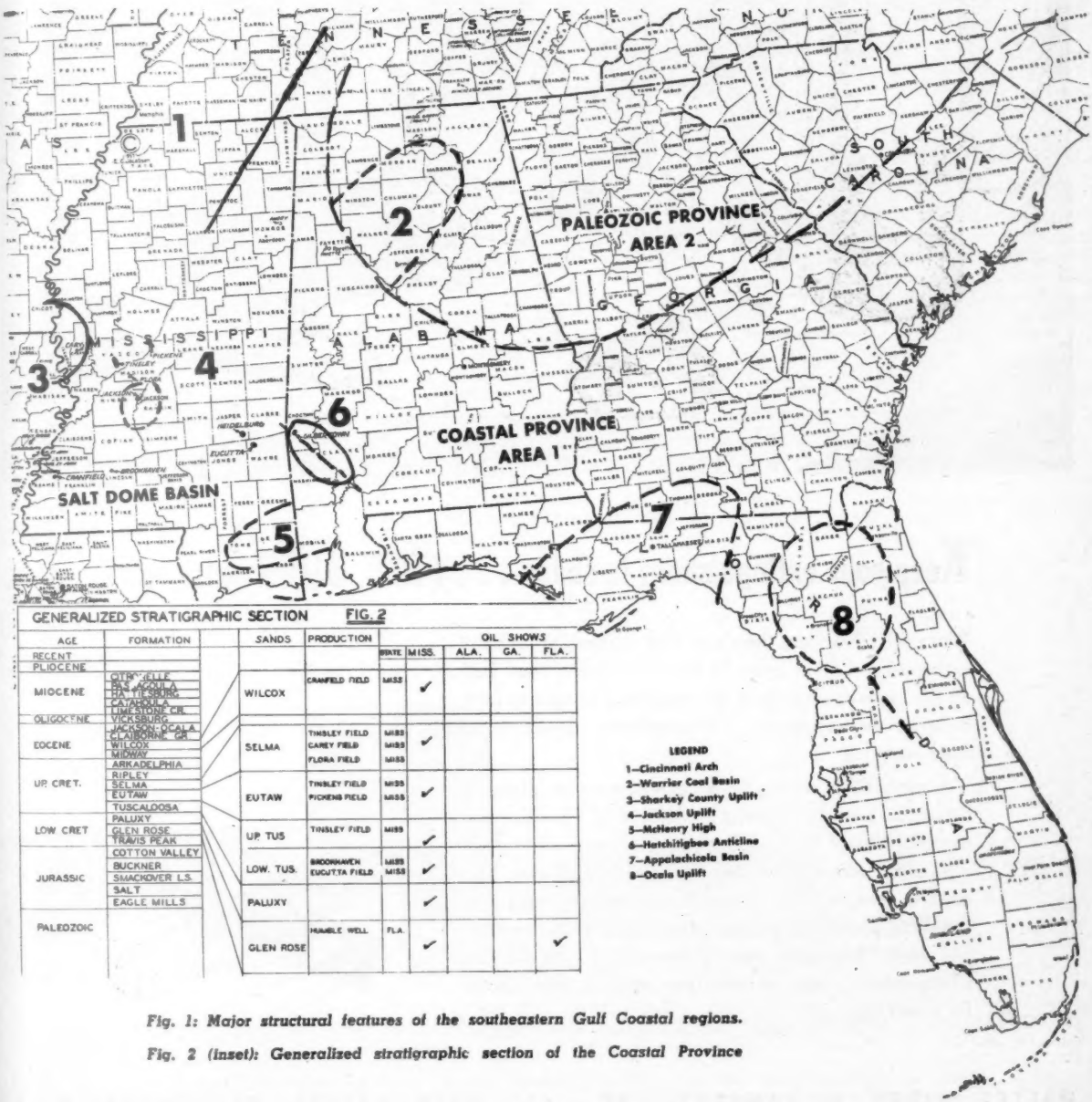
Regional Dip Interrupted

Another type of structure is found in the Pickens field. Here a fault has interrupted the regional dip so that an oil trap has been formed.

Pinchout fields of the East Texas type may be found in the oil-bearing formations in Mississippi. Experience with the Wilcox, Eutaw, Tuscaloosa and Paluxy formations elsewhere warns that associated sands in those formations have the habit of pinching out laterally. Operators are on the lookout for this type of oil trap. The discovery of pools, due to this condition, may result from a detailed study of sands within a formation and important data are being collected from tests that are drilling.

The total production for the state for 1943 amounted to 18,868,000 bbl. as compared with 27,545,000 bbl. for 1942. The drop in production during 1943 is accounted for by the reduced production at Tinsley, since most of the

(Continued on page 102)



GENERALIZED STRATIGRAPHIC SECTION FIG. 2

AGE	FORMATION	SANDS	PRODUCTION	STATE	OIL SHOWS MISS.	ALA.	GA.	FLA.
RECENT								
PLIOCENE								
MIOCENE	CITRONELLE, BIG APPLE, HATTIESBURG, CATAHOULA, LIMESTONE CR.	WILCOX	CRANFIELD FIELD	MISS	✓			
OLIGOCENE	VICKSBURG							
EOCENE	JACKSON, OCALA, CLAIBORNE, GR. WILCOX, MIDWAY	SELMA	TINSLEY FIELD CAREY FIELD FLORA FIELD	MISS MISS MISS	✓			
UP. CRET.	ARKADELPHIA, RIPLEY, SELMA, EUTAW, TUSCALOOSA	EUTAW	TINSLEY FIELD PICKENS FIELD	MISS MISS	✓			
LOW. CRET	PALUXY, GLEN ROSE, TRAVIS PEAK	UP. TUS	TINSLEY FIELD	MISS	✓			
JURASSIC	COTTON VALLEY, BUCKNER, SMACKOVER L.S., SALT, EAGLE MILLS	LOW. TUS.	BROOKHAVEN EUCUTTA FIELD	MISS MISS	✓			
		PALUXY			✓			
PALEOZOIC		GLEN ROSE	HUMBLE WELL	FLA.	✓			✓

Fig. 1: Major structural features of the southeastern Gulf Coastal regions.

Fig. 2 (inset): Generalized stratigraphic section of the Coastal Province

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Pure Oil Co. Operates Closed-Type Salt-Water-Disposal System at Pauls Valley

by Neil Williams

For a number of years most of the salt-water disposal systems installed have been of the open type. Lately, however, the adoption of the principles of the closed-type system is receiving increasing consideration. One of the more recent installations of the latter type is that being operated by Pure Oil Co. in the Pauls Valley field, Oklahoma.

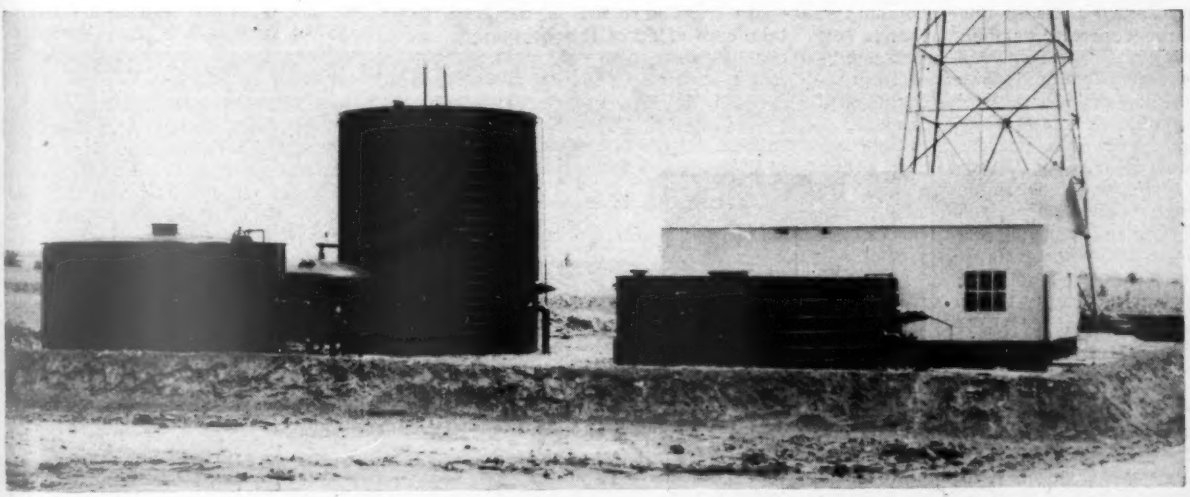
SALT-WATER-DISPOSAL systems employing injection wells come under two general classifications; namely, the open type and the closed type. Open-type systems function to precipitate the solids from the water and remove them by settling and filtering before the water is injected into the disposal wells. Closed systems, on the other hand, are designed to hold the solids in solution and inject them with the water into the disposal formation.

Open systems, as their name implies, provide for exposure of the water to the atmosphere. This is done by means of aeration towers or sprays, or simply by open reservoirs, tanks or pits. Contact of the iron compounds in solution in the water with the oxygen in the air causes a chemical reaction, changing them from a ferrous to a ferric state, which results in their precipitation as iron floc. Chemical or other treatment sometimes is added to hasten the precipitation so that it will occur before, instead of after, the filtering process.

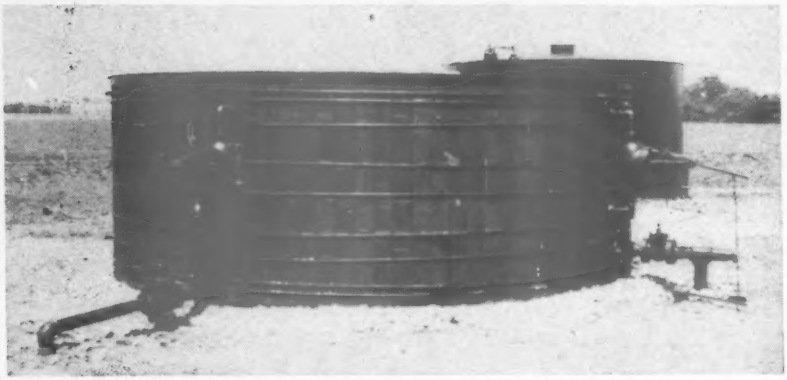
In a completely closed system, tanks or pits, filters and flow lines are all airtight, and the water does not come in contact with the atmosphere. Without the oxygen chemical reaction, most of the iron compounds are retained in solution in the water in the same ferrous state in which they existed in the reservoir from which produced. In this way they can be injected with the water into the disposal formation without much danger of clogging the sand face of the disposal well.

Some operators have developed semiclosed systems, which represent modifications of the principle of the closed system and embrace features of both general types. Instead of sealed tanks to exclude air, such systems usually have opentop pits but provide for the maintenance of a heavy scum of oil upon the surface of the water to prevent contact of the water with the atmosphere. Tanks and pits ordinarily are roofed but this serves largely to prevent contamination and disturbance of the oil scum. This practice precludes use of aerating towers or sprays, and is applicable only in the simplest of disposal systems.

Each type of system has its particular advantages and disadvantages un-



Pauls Valley salt-water-disposal plant showing skimming (receiving) vat, right foreground; backwash and overflow tank, left; sand filter and surge tank, center, and pump house and disposal well in background.



Skimming (receiving) vat showing float-operated dump valve controls on inlet, left, and circulating pump discharge line, right.

Sand filter showing inlet at front and discharge line to surge tank at top. Vertical line is bypass for backwashing.

der different conditions. In general, closed systems, as compared with the more elaborate open systems, involve lower installation and operating costs. Factors in this are the elimination of expensive aerating towers or sprays, large concrete, earthen or other settling pits or tanks, and treating equipment, reduction in filtering requirements, making possible the use of smaller and less costly filters. Also, since air does not come in contact with the water, the corrosive action of the water is minimized, and in many cases the need for special corrosion-resisting equipment and materials and precautions is avoided.

Much has been written in recent years concerning the installation and operation of open-type systems. In this time many of the new systems installed have been of this type. Previously, closed-type systems were more commonly employed. Lately, the trend again appears to be toward the latter systems. In turn, this article deals with one of the more recent installations of a closed-type disposal system.

This system has been placed in operation the past year by The Pure Oil Co. in the Pauls Valley field, Garvin County, Oklahoma. The field has been developed in the past 2 years with the above company as the largest operator. The plant is designed to take care of all of this company's expected future disposal requirements. Present water production is less than 800 bbl. daily. Disposal is through a single input well which has a tested capacity of 100 bbl. of water per hour at 500-lb. pressure.

Continuous Flow System

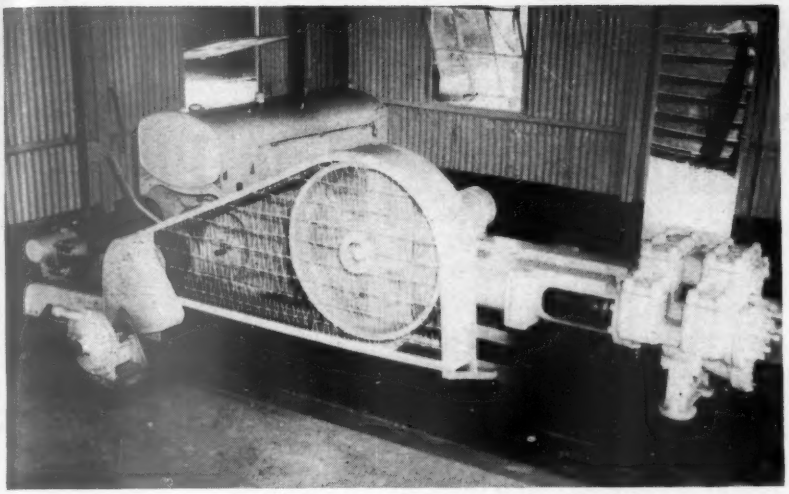
Production of all the company's wells in the field is processed through a continuous-flow heat treater located at the central separator and stock tank battery where the water is separated without contact with the atmosphere. Location of the disposal plant and well is at the lowest surface point in the field permitting gravity flow of the water from the treater to the plant. The main line to the plant consists of approximately 1,000 ft. of 8-in. cement-lined pipe. At the receiving tank (skimming vat in accompanying flow diagram) the 8-in. pipe is provided with an 8-in. balanced valve. All tanks, filters and lines at the plant are vaportight so that the entire field system from the producing wells to the input well is completely closed.

Flow of the water through the plant is indicated in the accompanying diagram. Operation is completely automatic, with float controls maintaining predetermined fluid levels in the tanks and constant, uniform feed to pumps circulating water through the system and to the input well. Adequate provision is made for backwashing filters at any time without shutting down the plant and for recycling and handling of surpluses at any point in the system in the event of trouble or for other reasons.

Automatic Controls

The receiving (skimming) vat is a round tank, 16 ft. in diameter and 6 ft. high (5 ft. inside), of redwood construction as a precaution against corrosion, and having a double vaporproof top. Fluid level is controlled by an 8-in. float box operating a 3-in. dump valve on the inlet line. Outlet is to the suction of a small rotary pump which circulates the water through a sand filter to the final surge tank for delivery to the input well. The volume of water circulated is controlled by throttling the discharge of the rotary pump. This is done by means of a 3-in. dump valve, in the pump discharge line which functions with a second 8-in. float box operated by the fluid level in the skimming vat. As a precaution against failure to hold a set fluid level, the skimming vat has a 2-in. overflow line to an auxiliary tank used for storage of backwash and overflow water. The overflow line contains a U-shaped gooseneck which remains filled with water at all times to prevent any air backing into the skimming vat when there is no overflow. The backwash tank has an outlet to the suction line of the circulating pump for disposal of this water as occasion permits.

Two filtering operations are provided: first, the sand filter ahead of the surge where the coarser solids and foreign matter are removed, and finally an individual-well Aloxite filter on the disposal-well input line. The sand filter consists of a closed cylindrical steel vessel, 7 ft. in diameter and 8½ ft. high, containing several beds of sands and gravel of different grades and mesh. The rotary pump, taking suction from the skimming vat, has a discharge pressure of from 40 to 50 lb. for circulating the water through these beds to the surge tank. A bypass from the inlet line to the outlet provides reversing the passage of water through the filter for backwashing when the sand and gravel beds become clogged. Backwashing is through a 4-in. blowoff



Reciprocating pump, right, for injection of water, and centrifugal pump, lower left, for circulating water through plant, V-belt driven from single gas engine.

line from the bottom of the filter to the backwash auxiliary tank. Clogging of sand and gravel beds and need for backwashing are indicated by the differential in pressure of the water stream at the inlet and outlet sides of the filter. Pressure gages are installed at both points for this purpose.

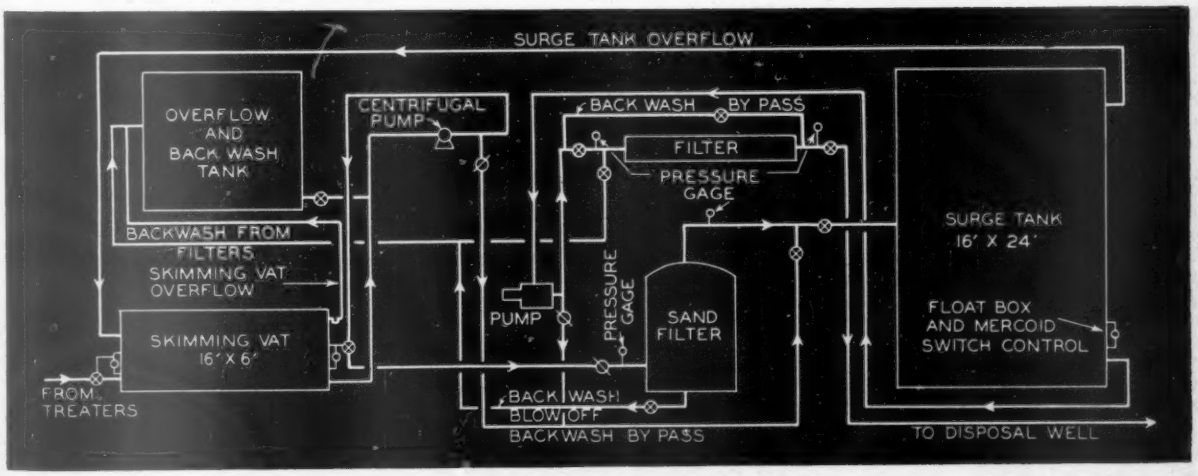
Suction for Well-Input Pump

Suction for the well-input pump is taken from the surge tank. This tank is 16 ft. in diameter and 24 ft. high, and, like the skimming vat, is of redwood construction as a precaution against corrosion. It also has a vaporproof top, and as a further precaution against the possibility of any air getting into the tank and coming in contact with the water an ounce of gas pressure is maintained in the top, filling the void as the water level is lowered. Gas for this is obtained from the engine fuel line through a 1-in. line with inlet direct to the top of the tank. A 3-in. overflow line is provided to the skimming vat.

In event of low fluid level in the surge tank, the water injection pump taking suction from the tank is automatically shut down. This is done by means of an 8-in. float box in the tank controlling a lever-type Mercoid switch which shorts out the engine powering the pump. A 2½ by 5 by 10-in. reciprocating pump, V-belt driven by a 60-hp. gas engine, is employed to pump the water to the input well. The same engine has an auxiliary drive which powers the small rotary pump circulating the water initially from the skimming vat to the surge tank.

The input line to the adjacent disposal well consists of 3-in. cement-lined pipe. Installed in this line is the horizontal-type individual well filter (see accompanying picture) for final filtering of the water before injection. The filter consists of a succession of 6 Aloxite cylinders, housed in a shell, 9 ft. long and approximately 1 ft. in diameter, through which the water is pumped. Like the prior sand filter it is provided with a bypass from the inlet to the outlet end by which circulation through the filter can be reversed for backwashing through a 3-in. backwash blowoff line to the backwash tank. Pressure gages are installed at the inlet ends to indicate the differential in flow pressure.

Individual well filter on disposal well input line. Overhead line is bypass for reversing water flow to backwash filter



Flow diagram of Pauls Valley salt-water-disposal plant.

General Review of Development and Economics of Natural-Gas Cycling Plants

*by J. M. Flaitz**

The situation of natural-gas cycling after the first 6 years of rapid growth was surveyed for the annual meeting of the Natural Gasoline Association of America with attention to revamping and expansion developments, economics, relation of operations to proration, marketing, and postwar prospects.

BEFORE reviewing the development of cycling operations, I will first define cycling to which the discussion and data that follow are limited. Natural-gas cycling or recycling, consists of producing natural gas which exists in a vaporous state in the reservoir, extracting certain liquefiable hydrocarbons, and returning the denuded gas to the same reservoir from which it was produced. Gas-cycling operations were first introduced on a commercial basis during the latter part of 1937 and the first plants were constructed in 1938. This part of the petroleum industry is, therefore, only 6 years old. Development at present is entirely confined to Louisiana and Texas. In California, one cycling plant is now nearing completion and another is under consideration. In Louisiana and Texas, at the end of 1940, 24 plants were in operation and 5 were under construction. At the present time, in the same states, there are 35 plants in operation; 1 nearing completion, 3 new plants under construction, and 2 others contemplated for the very near future. These 35 plants are operated in 25 fields by 28 different companies and are processing an aggregate of approximately 2.4 billion cubic feet of gas per day. They are extracting from such gas about 68,250 bbl. per day of products.

Many Plants Revamped

Many plants existing at the time of Pearl Harbor have been revamped to increase recovery of the light hydrocarbons and to produce fractionated products needed for the war effort, and three new plants have been completed and placed in operation. The Katy plant is being doubled in capacity and the Old Ocean plant is being expanded. Two of the new plants dwarf all others in size. The Katy plant will ultimately process approximately 500 million cubic feet of gas per day from wells located on some 30,000 unitized acres. The plant will produce about 13,600 bbl. of products daily and the plant investment is estimated at about $8,000,000. The Erath plant, now being completed, will produce about 18,000 bbl. per day of products. Of the operating plants, from the viewpoint of production, Cotton Valley is the largest, producing about 11,000 bbl. per day.

*Distillate Production Corp.

During the last 6 years the gas-cycling industry has grown until at the present time, there is an investment of about $40,000,000 in cycling plants alone. Of the combined total production of natural gasoline and cycling plants in Louisiana and Texas, 53.5 per cent is being obtained from cycling plants. The completion and operation of the Erath plant should increase this proportion to about 60 per cent. Thus, cycling operations are of extreme interest to the members of this association.

Operations in 24 Fields

The estimated gas reserves from which cycling plants are now operating in Louisiana and Texas, aggregate about 20 trillion cubic feet out of a total natural-gas reserve in the two states variously estimated at 50 to 75 trillion cubic feet. Although there are 47 classified gas-condensate fields in Louisiana, 92 in Texas, or a total of 139 such fields, cycling operations are, at the present time, conducted in only 24. Plants are currently being built in three fields and are being planned for six or seven more. It is estimated that by the end of 1944, approximately 95,000 bbl. per day will be produced from cycling plants now operating or under construction. On the basis of the known reserves of other fields and other governing factors, it is unlikely that other plants will be constructed until new fields are discovered or existing fields enlarged. This conclusion is stated, of course, after giving credit to the six or seven plants that are now under consideration. It is seen, therefore, that the industry is nearing full development in the light of present known reserves of gas-condensate.

The 25 fields employing cycling operations aggregate about 167,000 acres and contain some 850 gas wells. There is an average of about one well to each 200 acres and each well produces an average of about 80 bbl. of products per day, or, four-tenths barrel per acre per day. The average plant investment per barrel of products recovered per day is about $550, and about $16,000 per million cubic feet of daily throughput capacity. It should be remembered that these are average figures in which costs of prewar plants are included.

So much for present development. Now let us examine the general economics of cycling operations.

Quick Financial Return

Cycling is an economic expedient whereby the lease owner may obtain a financial return in a comparatively few years that would, under some circumstances, otherwise be spread over a very long period. In the case of the lapse of leases, this return could not be realized at all. This comparatively fast return may be realized within the scope of conservation operations. If an average reservoir of gas having a content of 1 to 1½ g.p.m., or 24 to 35 bbl. per million cubic feet of butane and heavier hydrocarbons, had a sufficient gas market for its production, over a reasonable length of time, and if the gas were produced through a modern gasoline plant, there would be no necessity for a cycling operation in that particular field. One of the great advantages of cycling is that unitization of the field is facilitated and all of the many advantages of unitization are obtained.

One of the most practical and best uses of the cycling operation is in connection with the production of the so-called "rim oil field"; that is, in a reservoir having an extensive gas cap with a comparatively minor accumulation of oil. In such a field, the gas cap cannot be produced without loss of reservoir pressure and the consequent loss in ultimate crude-oil recovery. The continued production of crude oil will result in higher and higher gas-oil ratios. If this production practice continues to ultimate reservoir depletion, considerable hydrocarbons will be lost by retrograde

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condensation and natural gas will be wasted. If a market for natural gas is available, it is normally impossible to expand the gas market at the same rate as gas-oil ratios increase. In such fields cycling may be a solution and a conservation measure resulting in increased production and revenues. Cycling will recover the liquefiable hydrocarbons from the gas in the gas cap without substantially reducing the reservoir pressure. Cycling operations are particularly desirable in the event such fields have a totally inadequate water drive. Operation may well start as pressure maintenance but as gas-oil ratios ultimately increase, effective natural-gas cycling will finally result. Continental Oil Co.'s Tepetate operation is an excellent example.

Relation of Proration

One economic bugaboo to cycling operations is the possibility of proration. Since there seems little likelihood that a sufficient gas market will be developed within the next 10 years to provide an economic outlet for all the gas-condensate fields now proven, let alone those to be proven, it is indicated that new discoveries will cause cycling operations to continue to grow in importance. It is only natural that pressure will be brought from refiners and crude-oil producers toward the proration of cycling operations. Such proration was unsuccessfully advocated before the Texas Legislature in the spring of 1939. There seems no necessity for proration of cycling plants since the present total production is only 3 per cent of the volume of crude oil produced in the same area and probably will not increase above 5 per cent. It can soundly be argued that if cycling plants are prorated, refiners should also be prorated, and that proration of cycling operations would be detrimental to good conservation. However, let us suppose that the production from cycling plants should substantially increase and some sort of proration be put into effect. Then on what basis could such proration reasonably be made? On an average production per well basis or on an acre basis, cycling plants are not producing as many barrels per day as comparable crude-oil wells. Therefore, if proration were instituted, cycling operations should be little affected.

The first cycling plants produced raw unfinished products which were marketed to refiners. It happened, at the time, that such products were undesirable to refiners and hence did not command a high price. Plant operators found that they could manufacture finished products and that the additional investment and operating expense necessary for the manufacture of these products was justified by the increase in market value. This was the start of the general trend of cycling plants to produce finished products. Because of the war, almost all cycling plants have been revamped to permit the manufacture of a variety of products.

In producing finished products, a cycling plant has several advantages over a refinery. A complete operation from raw material to finished product exists at one place without the necessity of transportation of the raw product by pipe line, truck or barge. It takes considerably less manpower to operate a gas-condensate field than it does a crude-oil field and for this reason among others, the operating expense is considerably less. Less personnel is required per barrel of capacity in a cycling plant than in a refinery; hence, operating expenses are less for the cycling plant. The quantity of steel used in gas-condensate fields, crude-oil field, cycling plants and refineries, is a direct measure of the investment. Recent studies indicate that only 28 per cent as much steel is required in the average gas-condensate field as is required in the average good crude-oil field. Less steel is also required per unit of production in a cycling plant than in a refinery. Therefore, the investment and operating expenses per unit of production favor cycling operations as compared with crude-oil production and subsequent refining.

Cycling plants are also in a better position to cut back on production in times of adverse market conditions than are refiners. Cycling plants should, therefore, be able to compete with refiners in marketing finished products and it seems that cycling plants will be permanently in the business of producing and marketing these products. At the present time, a cycling plant operator will receive from 40 to 60 per cent more revenue from finished products than from raw products. From the standpoint of basic economics, the refiner cannot pay a price for raw materials produced in a gas-condensate field that will preclude the manufacture of finished products in a modern cycling plant.

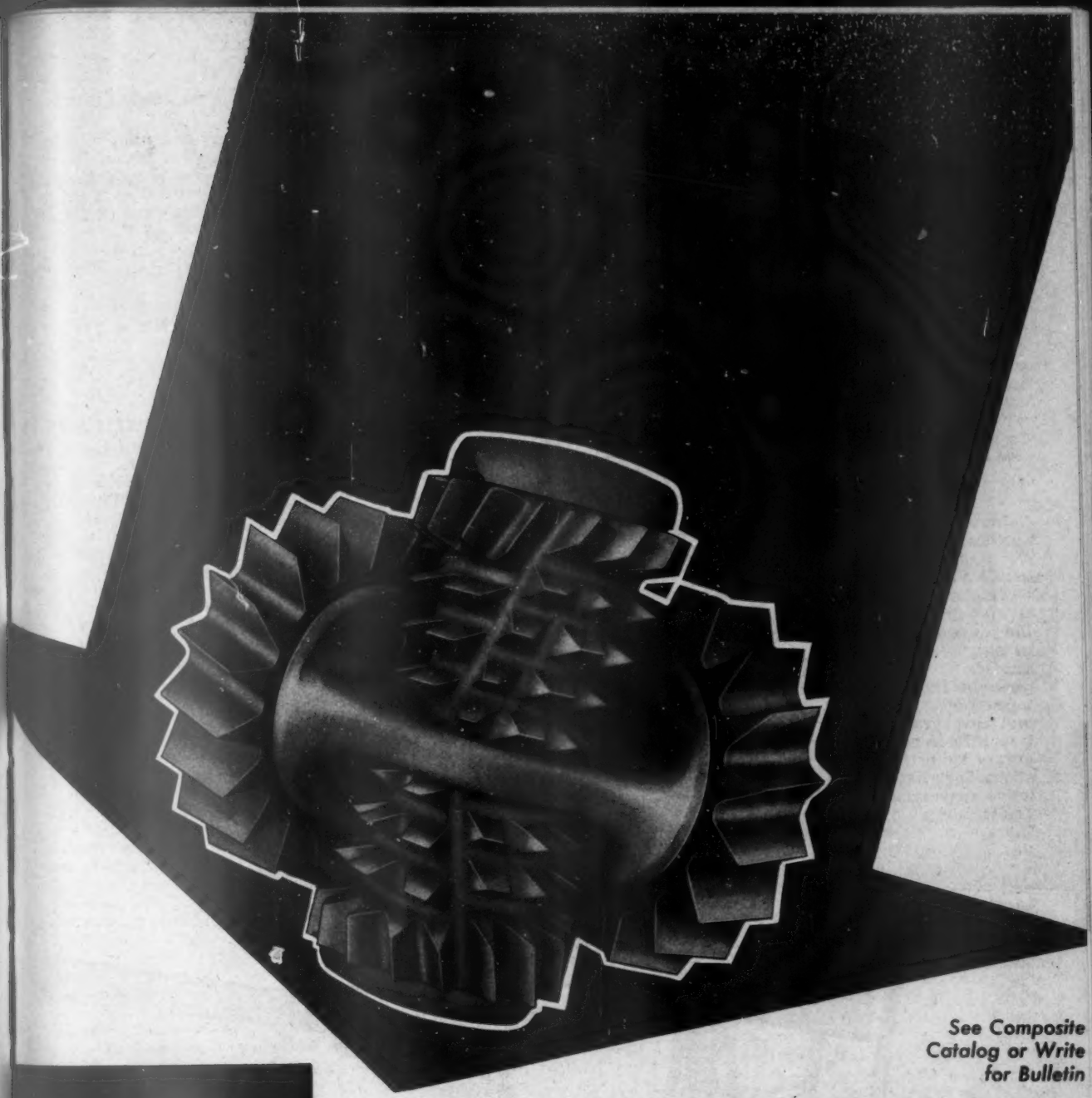
Marketing of Products

Marketing presents the major difficulty of cycling plants in producing finished products. The natural characteristics of the material handled by a cycling plant results in a large production of some grade of gasoline and the local gasoline market is rarely able to absorb the production. Since the volume produced seldom will justify pipe lines, and water transportation is not often available, the cycling-plant operator is dependent upon tank-car and tank-truck transportation. In transportation, the refiner generally has a tremendous advantage but the basic economic factors indicate that cycling-plant operators will continue to produce finished products and will find means of competing or cooperating with refiners.

There are many interesting new developments which can materially affect the future economics of cycling operations. For example, the raw materials needed for the production of the new superfuel, 2,3-dimethylbutane, are naturally available from cycling plants. An ethane-propane mixture can be cracked to ethylene, alkylated with natural isobutane or isomerized normal butane to produce 2,3-dimethylbutane. The resulting production of 2,3-dimethylbutane can be combined with the gasoline fraction to produce 100-octane gasoline with the result that substantially all of the production from cycling operations would end in one finished product, 100-octane gasoline. For such an operation, either large fields having large-capacity plants or, a combination of fields and plants in one area, is required. The investment is high, being of the order of $1,400 per daily barrel of 2,3-dimethylbutane. But on present prices the economics are sound and such plants have already been advocated, and one may soon be built.

Postwar Prospects

Postwar prospects and planning are currently the subject of thought and discussion, so let us briefly visualize postwar prospects for cycling plants. It has been shown that cycling plants will continue to be built with further discovery of suitable reserves and that such plants will, for natural economic reasons, make finished products of which gasoline is by far the most important. Therefore, the postwar prospects of cycling plants are directly related to such prospects for gasoline. There will probably be a temporary lull in gasoline consumption immediately following the war, but automobile manufacturers are planning and predicting the greatest automobile production in history. Huge estimates have been stated as to the number and use of domestic airplanes which may result from the training of thousands of expert pilots who may be supplied with airplanes of reasonable cost from the over-expanded manufacturing facilities. The tendency toward higher compression ratios requiring higher octane gasoline will substantially be increased by the demand for better performance. The increased performance of 100-octane gasoline over 91 octane normally used in a Douglas twin-engine transport is illustrative. Its takeoff run with 100-octane gasoline is reduced 16 per cent, its rate of climb increased 40 per cent, its cruising speed increased 8 per cent, its ceiling raised 27 per cent and its pay load increased 43 per cent. Since cycling plants can readily produce high-octane aviation gasoline, there are bright future prospects for this market.



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Future Role of Oil Fuels

by Arch L. Foster

In this article, which is a slightly abridged version of a paper presented at the seventh annual Midwest Power Conference, at Chicago, April 13-14, the author discusses the economic and manufacturing trends in the production of diesel fuels. He expresses the view that the engine designer who builds for a cetane number of around 45 need expect no difficulty in obtaining fuels which are satisfactory at current, nonpremium prices, and in reasonably adequate quantities. Foster is refinery editor of The Oil and Gas Journal.

FACED with an ever-increasing demand for motor fuel, presumably of as high or higher octane number than that sold prewar and obtained from a crude supply, which, predictedly, will continue to dwindle, the contest of the diesel engine operator for liquid fuel will resolve itself to an even greater extent than in prewar times, into a cost-and-price battle. The turn of this battle will hinge on at least two major factors; the motor-fuel demand in the light of available crude supplies; and the price ratio of diesel and motor fuels, and thus the competition of each for those most desirable fractions of the crudes—gas oils. Under our present conditions of fuel supply, little doubt exists that the refiner or marketer, in case of an insistent demand for both motor and diesel fuels from the same stock, will decide in favor of gasoline, and for two reasons. First, he must meet his customers' demands for gasoline, a market which is his primary outlet and money maker. To hold this market it must be supplied continuously with the grade of merchandise which will compete.

The second factor is the comparative price obtainable for a barrel of gas oil, as motor fuel when cracked, along with cracked furnace oil; or as straightrun diesel fuel without cracking or producing any motor fuel. Assuming that the refiner has a choice and can use his barrel of gas oil for either purpose; that is, he has enough for both markets or may put all in one or the other market, as he chooses, he then will use his raw stock for the purpose which will bring in the greatest return or will enable him to break into, or stay in a market in which he wishes to remain active.

Assume a catalytic-cracking unit, yielding 50 per cent of a premium blending agent for motor fuel of 80-octane number, 40 per cent of recycle stock or cracked furnace or diesel fuel of 40-45-cetane number and 10 per cent gas, loss and refinery fuel material. Assume, also, a second route for the refiner to travel, that of a thermal cracker, producing 65 per cent of motor fuel and 70-74-octane number, 20 per cent of cracked kerosene and furnace oil or a combination of furnace oils but running 25-35-cetane number, and 15 per cent coke, gas and loss.

Assume further prices of 6.5 cents per gallon for house-brand motor fuel, 5 cents per gallon for virgin gas oil, 4.5 cents per gallon for thermally cracked furnace oil and/or diesel fuel, and no net price for gas or fuel oil used in the refinery. From a barrel of gas oil (42 gal.) the return as furnace or diesel fuel is 5 cents by 42, or $2.10. Cracking thermally, the gross return will be:

Motor fuel	0.65 × 42 × 6.5 or	$1.764
Furnace oil	0.20 × 42 × 4.5 or	0.377
Total		$2.141

The motor-fuel product from catalytic cracking will be of greater value than that from thermal cracking, especially if octane numbers are at a premium as will be the case, probably, shortly after the close of the war. It seems safe to assume a comparative price of 6.75 cents per gallon for catalytically cracked gasoline. Catalytically cracked diesel-fuel fractions show higher cetane numbers than thermally cracked fuels from the same source, 5 to 10-cetane numbers being typical of the better ignition quality of the former. Therefore, it is reasonable to assume a slightly higher price for catalytic diesel or furnace fuels, for example 4.75 cents per gallon. So priced, the refiner's barrel of virgin gas oil will yield:

Motor fuel	0.50 × 42 × 6.75 cents or	$1.42
Furnace (diesel) fuel	0.40 × 42 × 4.75 cents or	0.80
Total		$2.22

The margin of greater profit for thermal cracking in this lineup is, theoretically, 5.2 cents per barrel, over selling the barrel as diesel fuel. For catalytic cracking the margin is 12 cents per barrel. The situation is really more in favor of cracking by either process than these figures indicate. Without cracking, the refiner cannot produce either house-brand or pre-

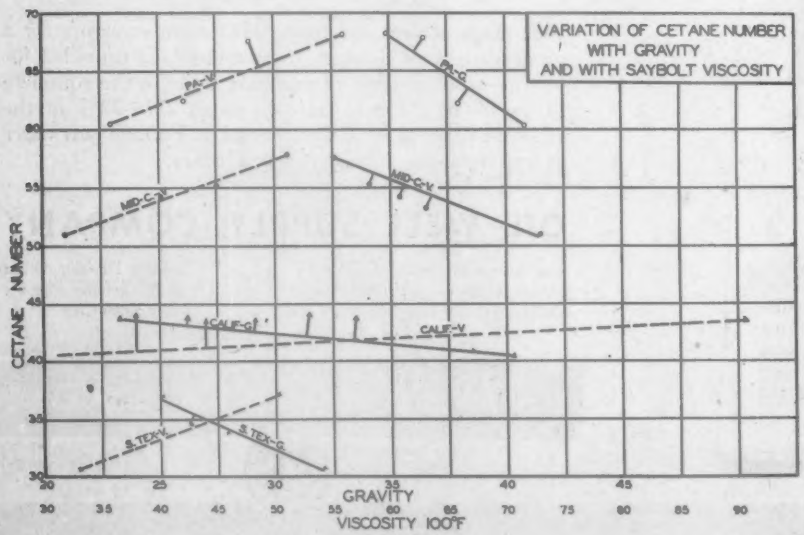

Fig. 1

mium gasoline, just sell straightrun gasoline as third grade at a decided loss. Furthermore, he cannot hold a retail position at all, without supplying house-brand gasoline either from his own plant or by purchase, and the latter is almost invariably the more expensive. Also, the refiner, who refines and then markets his motor-fuel products, wholesale or retail, will obtain a much higher average price for the material when delivered finally to the customer as compared to the over-all crude-plus-refining-plus-transport costs, than the prices chosen above. It is extremely difficult to assume values, yields and prices which are typical and at the same time include all the factors which the refiner must weigh and which affect his decision. As an illustration, the refiner has cracking units, topping units, treaters, etc., and trained personnel to operate them; he has large sums invested in these units, and they cannot earn money if not in operation. Therefore, he can afford to operate the plant without a profit, even at a slight loss, for a period, rather than to have units and staff idle or scattered. This rule will not hold for a long period of time, but obtains for any given interim not longer than a few months, normally speaking.

It is obvious that relatively minor changes in prices of these different products or in the yields obtained may change the profit picture radically. In fact, when market margins are narrow and demand uncertain the refiner, especially the small-plant operator, may change his proportions of products from day to day, altering operations almost from hour to hour.

What Is an Efficient Diesel Fuel?

It is desirable to know the properties required for most efficient engine operation. Such requirements as noncorrosiveness, stability, satisfactory viscosity, and freedom from solid materials may be taken for granted as basic specifications.

In a study on the evaluation of diesel fuels (Ainsley, Proc. A.P.I. 3, May 1941) experimental data on five fuels, one of them a blend of two of

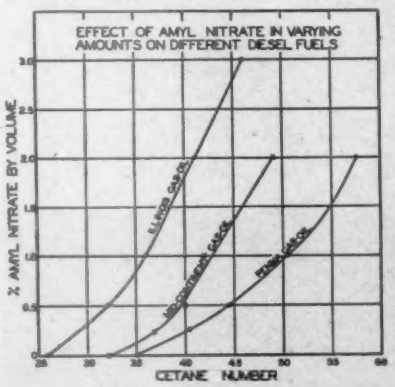

Fig. 2

TABLE 1—CETANE NUMBER SPECIFICATIONS OF DIESEL ENGINE MANUFACTURERS, 1943

Name—	Cetane No. (min.)
General Motors EMD Diesels	50
G-M Series 71, 2-Cycle	40
Guiberson Diesel	50
Cummins Auto. Diesel	50
Witte Diesel	46-60
Buda Lanova Diesels	46-60
Fairbanks-Morse, stationary & marine	45-60
Worthington Diesel	45
Chicago Pneumatic and Caterpillar	35
Waukesha-Hesselman	*60
Cooper-Bessemer, light	†45
Cooper-Bessemer, heavy	†40
G-M Diesel, Series 71, 1-D	50
G-M Diesel, Series 71, 2-D	45
Hercules Diesels	45
Baldwin Locomotive, de la Vergne	45
Cooperative Fuel Res., proposed (1941)	47
Average	46.6

*Maximum. †Diesel index.

the original four, were obtained showing the comparative fuel consumption for a given power output of the five in percentage of that of the lowest which was rated 100 per cent. From these data we have calculated the B.t.u. equivalent for the same power output of the fuels and have included the cetane numbers of each for comparison. The results follow neither the changes in cetane number nor in thermal values, as shown in Table 9.

In Table 1 are arranged the cetane number specifications promulgated by several diesel-engine manufacturers, and including some 18 models of medium and high-speed diesels, with one or more that may be rated low speed. The numerical average of these is 46.6, almost identical with the rating recommended by Coordinating Research Council as an average good diesel-fuel specification (47). The highest strict rating in this list is 50 (which is used by more than one company), and the impression is inescapable that a cetane rating of more than about 45 is not needed by most, if not all, diesel engines. This estimate agrees with the recommendations of several authorities, and is supported by findings of a number of laboratories and road test and commercial operations.

Nor does it appear that the highest cetane number is necessarily the most efficient in operating engines. Data available show that at slower speeds the lower the cetane number, within the limits tested, the higher the efficiency in fuel consumption per horsepower per hour. For any given type of fuel a point is reached in increasing engine speed where ignition quality is important, higher cetane number showing lower consumption. The engine speed at which this reversal occurs varies with the boiling range, the middle boiling point of the fuel.

So far as can be seen now, gas oil will be more valuable to the refiner as cracking-plant charge than as diesel fuel sold as such. Consequently, it is axiomatic that if the diesel-engine operator buys this gas oil as fuel he must pay the premium, and so lose one of his most highly publicized advantages—lower-cost fuel.

Under these conditions it seems to behoove the designer to build and the

TABLE 2—COMPARATIVE EFFECT OF 0.5 PER CENT BY VOLUME OF VARIOUS IGNITION IMPROVERS ON CETANE NUMBER OF A TYPICAL DIESEL FUEL

(J. Inst. Petr., Vol. 27, p. 348, 1941)

Additive—	Reference	Cetane No. change, %
Amyl thionitrite	USP 2,169,186	13.5
Butyl thionitrite	USP 2,169,186	13.5
Ethyl thionitrite	USP 2,169,186	13.0
Chloropicrin	USP 2,200,260	10.0
Amyl nitrite	USP 1,820,983	9.5
Acetyl peroxide	USP 2,174,680	9.0
Amyl nitrate	USP 2,158,050	8.9
n-Butyl nitrate	USP 2,031,497	8.75
Ethyl nitrate	BrP 352,350	8.0
Tetralin peroxide	USP 2,011,297	8.0
Sulfur (elementary)	.....	7.5
Diamyl disulfide	USP 2,177,719	7.5
Tetranitromethane	USP 2,185,157	7.0
i-Amyl mercaptan	USP 2,167,345	7.0
i-Amyl mercaptan	USP 2,184,440	7.0
Diethyltetrasulfide	USP 2,034,643	6.6
Nitrogen tetrasulfide	FrP 764,721	6.6
Nitroso-triacetone amine	BrP 405,658	6.5
Ethyl nitrogen sulfide	.....	6.0
Acetone peroxide	USP 2,107,059	6.0
Ethyl diphenyl pentazodiene	.....	6.0
Ethyl xanthic disulfide	.....	6.0
Ethyl diphenyl triazine	USP 2,136,456	5.5
Ethyl di-p-tolyl pentazodiene	USP 2,188,262	5.0
Di-p-tolyl triazine	USP 2,136,456	5.0
Hydrogen persulfide + sulfur	USP 2,206,594	5.0
Dibenzyl disulfide	.....	4.5
Benzyl bromide 50% + Et. nitrate	BrP 404,682	4.5
Butyl thiamine	USP 2,218,447	4.5
Propionyl peroxide	USP 2,198,327	4.1
o-Toluidine disulfide	USP 2,164,151	4.0
Aniline disulfide	USP 2,164,151	4.0
Phenyl p-tolyl triazine	USP 2,136,456	4.0
Pentamethylene p-tolyl triazine	USP 2,136,456	4.0
Di-p-tolyl tetrasulfide	USP 2,034,643	3.6
Di-i-amyl disulfide	.....	3.6
Diethyl disulfide	.....	3.5
Diphenyl triazine	USP 2,136,455	3.5
Tetraethyl lead	.....	minus 21

TABLE 3—LABORATORY DATA ON CRACKED DISTILLATES

	Penn.	Mid-Cont.	Illinois	Calif.	Rocky Mts.
Gravity, °A.P.I.	34.2	24.8	33.7	30.6	33.4
Viscosity, 100° F., SSU seconds	32.0	34.0	34.0	35.2	33.0
Cetane number	34.0	29.7	37.0	34.0	40.0

TABLE 4—BLENDS OF STRAIGHTRUN AND CRACKED STOCKS

Fuel number—	1	2	3	4	5	6
Per cent cracked	65.0	61.0	50.0	25.0	50.0	50.0
Per cent straightrun	35.0	39.0	50.0	75.0	50.0	50.0
C. N. cracked	42.0	42.0	37.0	30.0	30.0	26.0
C. N. straightrun	49.0	56.0	55.0	53.0	53.0	53.0
C. N. of mixture	45.2	48.0	46.0	45.9	40.0	38.0

TABLE 6—CRACKED FUELS TREATED WITH AMYL NITRATE

	Cetane number—		
% Additive by val.	Mid-Cont.	Penn.	Ill.
None	32.0	34.5	26.0
¼	37.0	40.5	...
½	40.0	44.5	32.0
1	42.0	50.5	36.0
2	49.0	57.5	41.0
3	...	...	46.0
Pour °F.	—32.0	—25.0	— 30.0
Vis., 100° F. SSU	32.0	31.0	33.0

TABLE 5—GRAVITY, VISCOSITY, CETANE NUMBER OF STRAIGHTRUN GAS OILS

Crude source of gas oils—→	E. Tex.	Calif.	Okla.	Ill.	W. Tex.	W. Tex.	S. Tex.	La.	Kans.	Wyo.	Wyo.	N. Mex.	Penn.	Mich.	Ind.
Gravity	33.6	26.6	35.3	33.2	36.6	35.2	27.2	36.9	32.9	36.0	33.7	29.3	37.4	32.9	33.8
Vis., 100° F. SSU	43.0	51.0	41.0	46.0	42.0	38.0	39.0	52.0	44.0	45.0	44.0	46.0	46.0	39.0	46.0
Cetane number	57.0	41.0	56.0	52.0	63.5	48.0	32.0	63.0	59.0	68.0	59.0	48.0	65.0	56.0	52.0

operator to use diesels designed for other fuels. And other fuels will be available, obtainable on the bases of cetane number and other qualities at prices appreciably lower than those for virgin paraffin-base, high-cetane-number gas oils. Catalytic recycle stocks, and to an even greater degree thermal recycle stocks, are much less valuable for cracking-still charge than the same virgin stocks. Engines designed to operate on these can be so built as to show a greater horsepower-hours-per-dollar output than engines operating on the more expensive products. Tables 3 to 8 show comparative data on cetane number, viscosity, gravity, and other properties of straightrun and cracked stocks.

In Table 3 is seen a qualitative relationship between A.P.I. gravity, Saybolt viscosity and cetane number of thermally cracked recycle or diesel-fuel stocks (Ainsley, Jr., Soc. Auto. Engrs., Vol 50, p. 160T, 1942). The degree of cracking of the virgin stocks from which these products are taken is not known and therefore no quantitative relations can be established, even if such may exist. It is noteworthy, however, that from whatever source, the cracked stock shows a lower cetane number with heavier gravity. None of these stocks show cetane number high enough for the best performance of high-speed diesels operating at higher speeds, according to the best accepted practice. Table 4 shows how low-cetane-number stocks may be improved by blending with the required percentages of high-cetane-number virgin stocks. Note that the highest number of any of the six cracked stocks is 42, with 26 as the lowest, all too low for good operation of automotive-type diesel engines at higher speeds. By blending with from 35 to 75 of straightrun stocks of from 49 to 56 cetane number, all but two of these stocks are made acceptable on this quality for high-speed use.

In Table 5 are shown several straightrun gas oils which are suitable with the possible exception of two—California, C.N. 41, and South Texas C.N. 32, for high-speed diesel use. Also, these materials can be used for blending with low-cetane-number fractions to provide fuels of satisfactory ignition quality. For example, the Kansas gas oil in Table 5, C.N. 59, may be blended 50-50 with the cracked Mid-Continent in Table 3, C.N. 29.7, to make a fuel of approximately 44.5, equivalent roughly to the average required rating according to many practical authorities.

We must not forget, however, that, in whatever manner stocks may be blended to make low-cetane-number products salable, the consumer must pay for the higher cetane numbers, generally virgin stocks, in terms of their value for motor-fuel production.

Suitable fuels may be obtained by this blending of low-cetane with high-cetane-number stocks, which is especially a means of disposing of low-grade cracked stocks which are satisfactory on other specifications but low in ignition quality. The consumer can obtain such fuels at lower prices than straightrun fuels can be bought, under normal conditions. Some variation may be had in cetane number by varying the distillation range, as shown in Table 7, which illustrates from fractions of different boiling ranges of the same fuels how gravity, viscosity, boiling range and cetane number vary. From the curves it is noted that while California fuel shows the widest ranges in viscosity it has the least change in cetane number, all in the 40-45 range. Therefore, theoretically, at least, varying viscosity demands may be met in this fuel without affecting ignition quality appreciably. Of these typical fuels only one is unsatisfactory in ignition quality, the South Texas product, with California on the borderline.

(Continued on page 67)

TABLE 7—VARIATIONS OF CETANE NUMBER WITH GRAVITY, VISCOSITY, BOILING RANGE

Crude source—	Pennsylvania	Mid-Continent	South Texas	California
Gravity, °A.P.I.	40.7 to 34.9	41.5 to 32.7	32.1 to 25.2	40.2 to 23.4
Viscosity, 100° F. SSU	36 to 56	32 to 51	33 to 50	31 to 91
Boiling range, °F.	250-620 to 600-696	328-576 to 563-697	334-560 to 526-682	352-576 to 602-700+
Cetane number	60.5 to 68.1	50.9 to 57.6	30.6 to 36.8	40.4 to 43.5

(Distilled fractions of same fuel.)

TABLE 8—COMPARISON OF CETANE NUMBERS OF STRAIGHTRUN AND CATALYTICALLY CRACKED DIESEL FUELS*

Crude source—	Fraction—	Cetane number— Straight-run	Catalytically cracked	C.N. loss
Illinois	Gas oil	56.0	48.0	8.0
Kansas	Gas oil	58.0	46.0	12.0
South Texas	Gas oil	54.0	40.0	14.0
Gulf Coast	Gas oil	37.0	30.0	7.0
Mount Pleasant (Texas)	Heavy gas oil	...	52.0	...
East Texas	Heavy gas oil	59.0	46.0	13.0
Lafitte (Louisiana)	Heavy gas oil	63.0	54.0	9.0
Lafitte (Louisiana)	Light gas oil	65.5	57.3	8.2
West Texas	Light gas oil	50.0	43.0	7.0
Mid-Continent	Light gas oil (1 pass)	69.0	56.5	12.5
Mid-Continent	Light gas oil (4 passes)	69.0	47.0	22.0
Mid-Continent furnace	Oil cut (4 passes)	69.0	51.0	18.0
Heavy grade B coastal	Light gas oil	53.0	40.7	12.3
Heavy grade B coastal	Heavy gas oil	55.0	41.5	13.5

*The Oil and Gas Journal, Dec. 9, 1943, p. 34; The Oil and Gas Journal, Apr. 13, 1944.

TABLE 9—COMPARISON OF THERMAL VALUES, FUEL CONSUMPTION AND CETANE NUMBERS OF FIVE DIFFERENT DIESEL FUELS

Result—	Fuel A	Fuel B	Fuel C	Fuel D	Fuel BD*
B.t.u. per gal.	138,000	143,350	142,200	135,450	139,400
Fuel cons., per cent	103.4	100.0	101.5	105.5	104.7
Equivalent B.t.u. for 100% power	142,700	143,350	144,300	142,900	146,000
Equivalent price value, per cent	96.7	100.0	98.5	94.8	93.5
Equivalent value, cents per gal.	8.7	9.0	8.9—	8.5+	8.6
Cetane number	56.1	40.5	33.2	41.3	40.8

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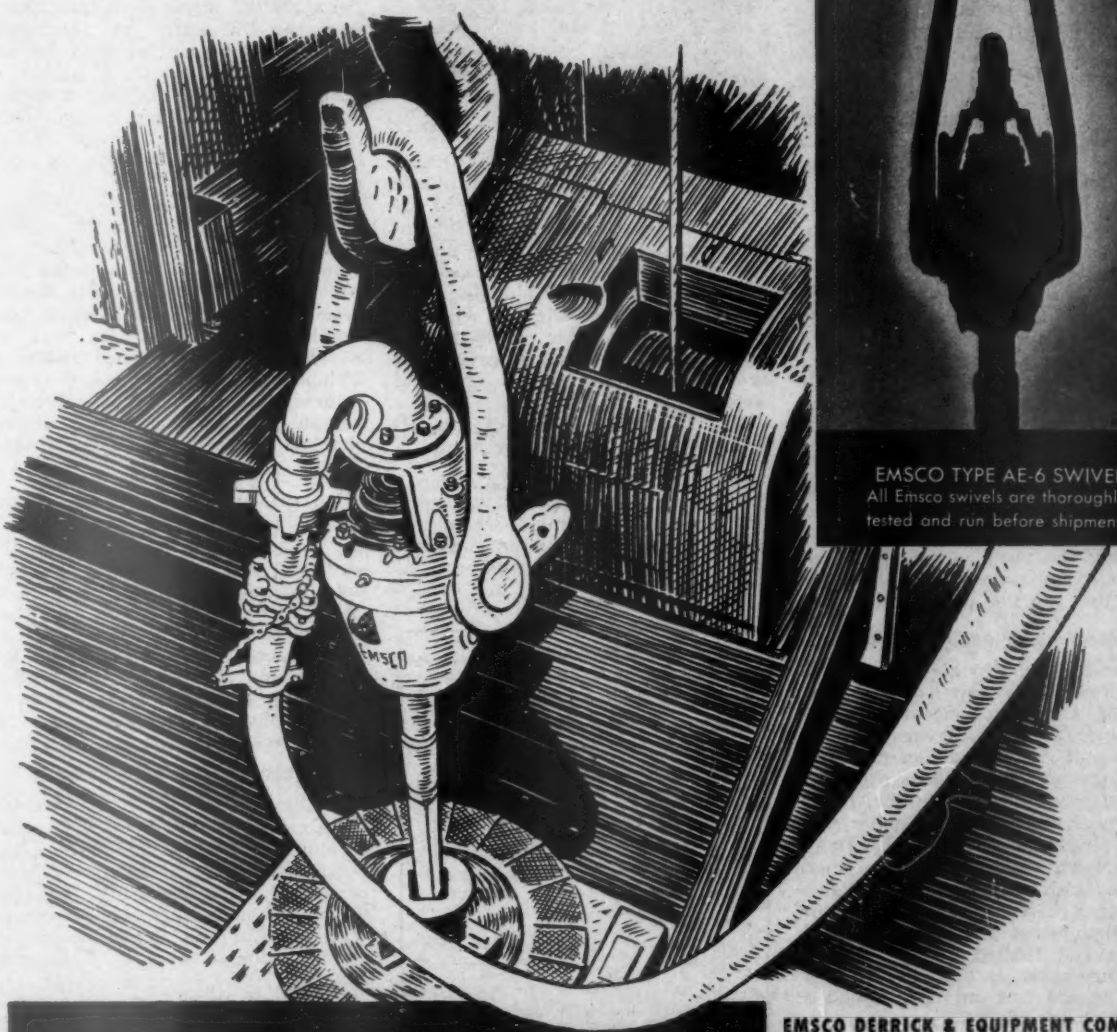

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The Drowning and Revival Of Gas Wells

by S. T. Yuster and K. J. Sonney

THE revival of intentionally or accidentally drowned gas wells is a problem which has confronted gas producers for as long as the industry has existed. The water which may have come from leaky casing, from other horizons, or from actual injection at the surface for the purpose of controlling a wild well, may build up a head in excess of the formation pressure and penetrate the producing strata. A somewhat similar effect is produced when water comes into a gas well and reduces the flow from it. In repressuring projects or in the secondary recovery of petroleum by air and gas-drive methods, the entrance of water into the productive horizon at the input wells is very harmful. In all the examples cited above, the effect of the water is to retard the flow of gas from or into the formation. In some cases the action may be so drastic as to close off flow completely. This effect, in the case of a gas-producing well, is not due to a head of water which neutralizes either partially or completely the formation pressure since pumping the water off the well does not bring it back to its former productivity. Probably the most logical and satisfactory explanation of the phenomenon is that it is due to Jamin action.[1,2]

S. T. YUSTER

KERMIT J. SONNEY

This is the first of three articles which will deal with different phases of the revival of intentionally or accidentally drowned gas wells. This installment describes the Jamin action, and the experimental procedure followed in making the unplugging tests. The subsequent installments will deal with safe drowning of gas wells, and treatment of gas sands to prevent or overcome the detrimental effect of water.

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Nature of Plugging Action

In order to check this explanation, an artificial consolidated sand in the form of a slide (made of sintered grains of Pyrex glass) was drowned with water and the action observed under the microscope. An aspirator bulb was used to force the fluids through the sand. No difficulty was encountered when air alone was flowing through the sand. It was then drowned with water and only a slightly greater pressure was required for flow than with the air. While the sand was still filled with water, air was introduced at the inlet end of the slide and had only penetrated a short distance when the pressure required for further movement had increased to such an extent that it was almost impossible to force in more air with the hand aspirator. Observation through the microscope showed the air bubbles occupying some of the pores; when pressure was applied, these bubbles attempted to pass through the constrictions between the sand grains. In so doing, it was necessary to distort the bubble considerably. This distortion requires considerable force and, if the breakdown pressure is not exceeded, the bubbles remain in place and hamper the movement of fluids through the sand. In other words, the conducting medium is no longer simply an assemblage of sand grains but must be considered as a complex of solid grains and relatively stationary gas bubbles and water. This phenomenon was first discovered by Jamin, a French physicist, in 1860 and it is known as Jamin action.[1]

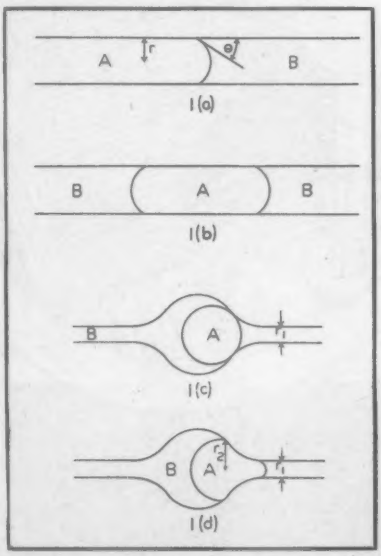

Fig. 1

Theory of Jamin Action

The phenomenon will be examined more closely in order to understand it more completely and to see the possible methods of attack to overcome the difficulties. Since this particular problem is chiefly concerned with the bubble-distorting phase of Jamin action, it alone will be considered.

Fig. 1(a) shows two immiscible fluids A and B in a capillary with fluid B showing a greater avidity (or wettability) for the capillary wall than A. Fluid A could be air or any other gas while B might be a liquid such as water. This setup is similar to the capillary rise experiment with the capillary in a horizontal position instead of vertical.

The surface tension of a liquid or the interfacial tension between two liquids may be defined as the force in dynes which must be exerted along 1 cc. edge of the surface in order to maintain it in a given equilibrium position. In other words, it is the tensile strength of the surface and will be designed by the letter T. In Fig. 1(a) the length of the contact line between fluids A and B and the capillary wall is $2\pi r$ on the circumference of the tube. Since this edge of surface requires that a force of T dynes shall be exerted along each centimeter of its length in order to maintain it in a given equilibrium position, the total force is equal to $2\pi rT$. This is only true if the force acts in the direction the surface makes with the capillary wall. This direction is designated by θ, the contact angle of fluid B when in contact with fluid A and with the solid of which the capillary wall is composed. In order to obtain the magnitude of the force which must be applied along the axis of the tube, the above expression must be multiplied by cos θ. The force exerted along the axis of the capillary by fluid B in displacing A, or the force which must be applied through A to prevent B from displacing it, is equal to:

$$F = 2\pi rT \cos\theta \tag{1}$$

Since pressure is equal to the force per unit area, the pressure necessary to maintain equilibrium should be Equation 1 divided by the cross-sectional area of the capillary or:

$$P = \frac{2T\cos\theta}{r} \tag{2}$$

If two such surfaces are present in a capillary with equal contact angles, as is shown in Fig. 1(b), there would be no tendency for displacement since the two pressures involved are equal and opposite.

However, the capillaries making up oil or gas sand are not as simple as those which have been considered up to this point. Their size and shape vary greatly and they are intimately interconnected.

A portion of a highly idealized capillary is shown in Fig. 1(c) with fluids A and B in it. If an attempt is made to force fluid B through this system, fluid A will begin to enter the constriction of the capillary as is shown in Fig. 1(d). Let r_1 and r_2 be respectively the radius of contact of the two fluids and the solid at the smaller and larger ends. Then:

$$P_1 = \frac{2T\cos\theta}{r_1}$$

$$P_2 = \frac{2T\cos\theta}{r_2} \tag{3}$$

These pressures neutralize one another somewhat and the resulting resisting pressure is their difference or:

$$P = P_1 - P_2 = 2T\cos\theta\left(\frac{1}{r_1} - \frac{1}{r_2}\right) \tag{4}$$

When a small amount of pressure is first applied to B in the system shown in Fig. 1(c) r_1 is not very much smaller than r_2. As the pressure is increased, r_1 becomes progressively smaller and at a greater rate than r_2 is decreasing.

From Fig. 1(d) and Equation 4 it can be seen that P, the resisting pressure, will finally reach a maximum. It is at this point that the Jamin action will break down and the bubble will pass through the constriction. If this maximum is not reached, the bubble can remain in position indefinitely and oppose any flow through the particular channel. If the maximum is exceeded by only a very small amount, the bubble will move and in passing from a constriction to an expansion in the cross-section of the capillary, a negative resisting pressure will be created. In other words, the bubble in this position will actually aid the flow of fluids.

Up to this point, consideration has been given to a single constriction and bubble. If there are n of these in a length of sand 1, the resisting pressure per unit length will be:

$$\frac{P}{1} = \frac{2nT\cos\theta}{1}\left(\frac{1}{r_1} - \frac{1}{r_2}\right) \tag{5}$$

If it is assumed that the contact angle θ is zero, Equation 5 becomes:

$$\frac{P}{1} = \frac{2nT}{1}\left(\frac{1}{r_1} - \frac{1}{r_2}\right) \tag{6}$$

With the parenthetical expression at a maximum P/1 gives the breakdown gradient for the Jamin action.

The surface tension of water T is a function of temperature and, therefore, the magnitude of the Jamin action is affected by the depth of the formation. Values of T versus temperature are listed in the following table:

TABLE 1—EFFECT OF TEMPERATURE ON SURFACE TENSION OF WATER[4]

°C.	T	°C.	T
0	75.6	30	71.18
5	74.9	40	69.56
10	74.22	50	67.91
15	73.49	60	66.18
18	73.05	70	64.4
20	72.75	80	62.6
25	71.97	100	58.9

It is of interest to substitute some hypothetical values in Equation 6 in order to determine the order of stability of this effect. Let $r_1 = 0.01$ cm., $r_2 = 0.02$ cm., $T = 72$ dynes/cm., and $n = 25$/cm. Then $P/1 = 80$ lb. per sq. in. per ft. If the Jamin action is in operation over a distance of 10 ft. under the conditions given above, it will take a total applied pressure of 800 lb. per sq. in. to break it. Since an actual sand is made up of capillaries having a wide range of sizes, some of the smaller-size channels may retain their Jamin plug even though the breakdown gradient has been exceeded for the larger ones.

Possible Methods of Attack on Problem

An examination of Equation 6 will indicate the possible methods of attack on the problem of reviving drowned wells. Applying pressure gradients above that necessary for a breakdown of Jamin action is a possibility, but since this is only controllable from the well side, (the sand pressure is approximately constant) it will only apply to gas injection in wells in low-pressure gas-producing formations. According to Equation 6 a lowering of the surface tension T of the water in the sand should lower the breakdown gradient. Work on the surface tension of solutions of various compounds has shown that the surface tension is only lowered to the neighborhood of 30 dynes/cm. with the most efficient surface modifiers. This would reduce the breakdown gradient by the ratio of 30/72 or to 0.417 of the original. Even though the breakdown gradients are usually quite high, reducing them by this factor may well bring them into the range where it would be practical to apply pressures to break the plug. It is felt, however, that this would be the exception rather than the rule. Since Jamin action cannot exist unless two immiscible fluid phases are present, the removal of one of the phases should eliminate the plugging. If the water could be removed from the sand by some means or another, the difficulty would be eliminated. It should be possible to do this by adding some fluid to the water which is miscible with it in all proportions and which has a high vapor pressure. The condition of complete miscibility is necessary in order not to create any new Jamin action. A high-vapor-pressure fluid when added to water produces a solution which has a higher vapor pressure than the original water. Under such conditions the rate of evaporation of the liquid will be more rapid than with pure water alone and the Jamin action should be gradually eliminated as gas passes through the region. The high-vapor-pressure fluids usually decrease the surface tension of the water which is another favorable factor.

From the foregoing discussion, it can be seen that the methods of attack on the problem fall into the following subdivisions:

1. Removal of water from the vicinity of the well bore by increasing the pressure differential between the well

bore and the formation to overcome the Jamin action and force the water ring far into the sand where its thickness and effectiveness in plugging will be greatly reduced.

2. Reducing the surface tension of the water in the sand and thereby decreasing the pressure necessary to move the water.

3. Dilution of the water in the sand with water-miscible, high-vapor-pressure solvents resulting in a more volatile fluid mixture which may be removed by evaporation.

4. Combination of the above methods.

With the above possibilities in mind, a series of experiments was made in the laboratory to test their practicability.

Apparatus

The apparatus was essentially a system whereby gases and liquids could be made to flow radially through a cylinder of sandstone under various pressures. The experimental setup is shown in Figs. 2, 3 and 4. Nitrogen gas was used in the tests since it is inert, convenient, and safe. A high-pressure regulator reduced the tank pressure to approximately 15 lb. gage, and a second regulator further reduced it to the pressure selected for the test. The pressure was measured by a mercury manometer. From the low-pressure regulator the gas was admitted to the core holder through a needle valve and passed radially through the core from the outside towards the center. A graduate connected to the outlet of the core holder through a fluid sealed trap served to measure liquid which came through or from within the core. The graduate and the outlet end of the core holder were connected through a T-tube to a capillary flow meter which measured the rate of flow of gas coming from the core. The flow meter was provided with several calibrated capillaries which permitted a considerable range of flow rates to be very accurately measured. The entire apparatus was in a constant temperature chamber maintained at 20° C.

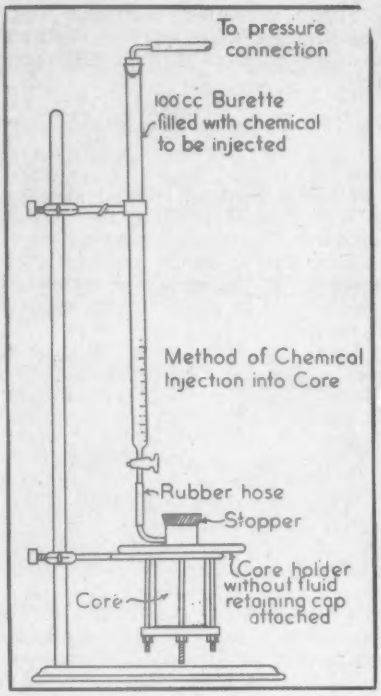
To pressure connection
100 cc Burette filled with chemical to be injected
Method of Chemical Injection into Core
Rubber hose
Stopper
Core holder without fluid retaining cap attached
Core

Fig. 3

Four diamond-drilled cores from the Bradford sand were used in the experiments. They had previously been extracted with butanol to remove the oil and water, placed in an electric oven at 105° C. for 15 hours, and finally cooled in a desiccator. The characteristics of the cores are given in Table 2.

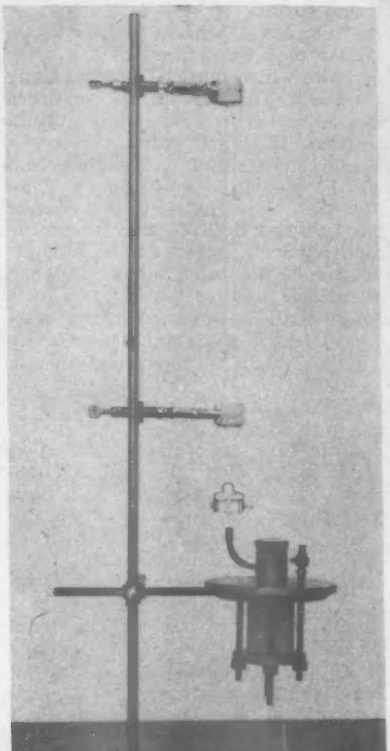

Fig. 4

TABLE 2

Core No.	Dimensions of core in cm. O.D.	I.D.	Height	Porosity in %	Permeability in md.
M-3	5.67	1.73	6.77	20.0	30.5
M-9	5.60	1.68	6.71	20.0	34.5
LH-5	5.61	1.73	7.17	16.8	16.8
LH-10	5.65	1.70	7.18	15.2	6.2

Experimental Procedure

The general procedure in making the unplugging tests was to place a previously weighted core in the core holder, and with the core in place but without any gas flowing, distilled water was run into the holder through a hose connected to the water filling cock.

After a core holder was filled with water, the valves were closed, and nitrogen under pressure was admitted to the pressure pot, thus forcing water through the core. Water was passed through the core until the rate of flow became constant as determined by readings of the quantity of liquid collected in the graduate at 5-minute intervals. When the core had been flooded, it was removed, weighed, and then replaced in the core holder from which the water had

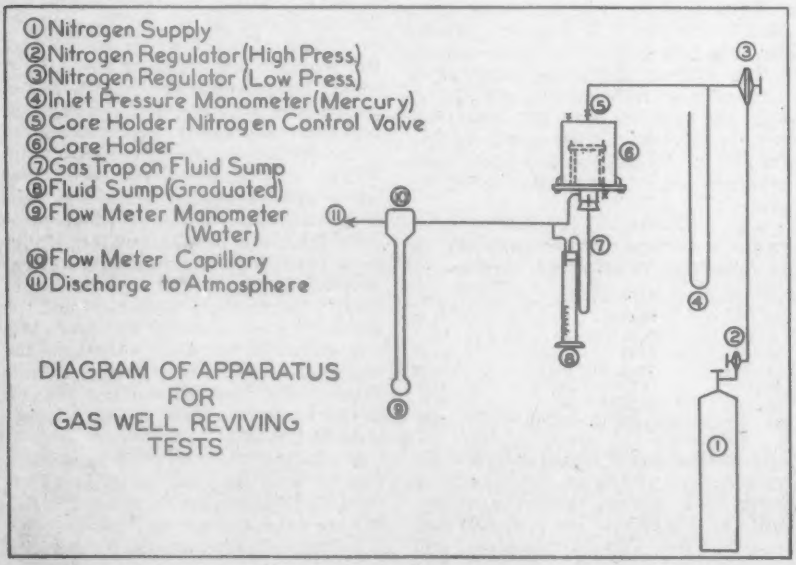

Fig. 2

been removed. The gain in weight of the core represents the amount of water which it took up during the drowning process. Gas was then passed through the core until the rate of gas flow became fairly constant. The core was again removed from the holder and weighed. The difference between this weight and the dry weight gives the amount of water in the sand prior to treatment with an unplugging compound.

For the unplugging treatment, the core was clamped into the core holder, but was not inserted into the pressure pot. The core holder was inverted and connected to a burette as shown in Figs. 3 and 4. With this arrangement of the apparatus, the various chemicals could be injected at any desired pressure from the center of the core radially outward as would be necessary in applying them in the field. When an injection was made, the operation was carried on until there was evidence of the liquid coming out of the core as determined by the first appearance of liquid on the outside of the core. As soon as the injection was completed, the core was removed from the holder, reweighed, quickly replaced into the core holder and inserted into the pressure pot. Gas was then passed through the core and the effects of the injection noted.

All flow readings were taken at 5-minute intervals. Weights were recorded to the nearest 0.1 g. At the end of each run in which only purified volatile chemicals had come in contact with the core, the core was placed in an electric oven at 105° C. for several hours and cooled in a desiccator. If impure chemicals had been injected, the core was first extracted before being placed in the oven.

Unplugging Tests

In order to investigate the general nature of the action of volatile, water-miscible liquids on the Jamin plug, the following were used in a series of experiments: ethyl alcohol, methyl alcohol, acetone, 9:1 acetone-ethyl ether mixture, and crude methanol. These substances have a fair range of vapor pressures and should evaluate the effect of this factor on unplugging. A 1 per cent solution of Igepon T (a wetting agent manufactured by General Dyestuffs Corp.) was also used in order to study the effect of the lowering of surface tension as separate from vapor pressure increase.

In the first experiment, core M-3 was flooded with water, subjected to a gas flow until a fairly constant rate was obtained, and finally ethyl alcohol was injected in the same manner as the water (from the outside towards the center of the core at 200 mm. Hg. pressure). As soon as the first few drops of liquid came through the core, the injection was stopped. Measurement of the surface tension of this collected liquid showed it to be nearly all water. Fig. 5 is a graphical summary of this experiment. The line parallel to the x-axis gives the rate of flow of gas through the water-containing core prior to alcohol injection. This is about one-sixtieth of the rate when no water is present. After alcohol was injected, the liquid in the core contained 19.6 per cent alcohol and 80.4 per cent water. The rate of gas throughout as a function of time for the first alcohol injection shows how remarkably the rate picks up after treatment. The second alcohol injection produced an even more rapid return to the original behavior when the core was dry. In fact, the rate after treatment seems to be a bit above the original. In this instance, the single injection would very likely have been sufficient if it had been carried to its end point.

The percentage of the pore space filled with water after the drowning was 72.5 per cent. After flowing gas through this drowned core for some time, 46.4 per cent of the pore space remained filled with water. Of this water removed, 76.5 per cent of it was collected as liquid in the receiver while the remaining 23.5 per cent was removed as a vapor by the gas passing through the core. In most of the experiments, the recovery of liquid water was even higher than with smaller quantities being taken off by the gas. This would indicate that the gas does not readily vaporize the water in the sand. It should be pointed out, however, that if sufficient time were allowed, the gas should remove the water. (This depends on the quantity of water in the sand and the available gas.) It might not be economical to do it in this manner.

When the gas is allowed to flow through the sand after injection of the volatile liquid, the fraction of the removed liquid which is collected as liquid is of the order of 25-30 per cent. This is considerably lower than when water alone is in the core and shows that one of the effects of the added liquid is to aid in the removal of the water as vapor.

Comparison of the Effect of Surface Tension and Vapor Pressure

In order to isolate the effect of surface tension alone on the unplugging, a 1 per cent solution of Igepon T was used for treatment. This solution has a surface tension of about 30 dynes/cm. as compared to 72 for water at room temperature. The vapor pressure of this solution should not be too far from that of water so the effect of this factor is eliminated. The results of this test are summarized in Fig. 6. It can be seen that the lowering of the surface tension has only had a slight effect on the Jamin plug. The same graph shows the effect of alcohol for purposes of comparison. The alcohol has a very beneficial effect and it appears, therefore, that the predominating factor is the raising of the vapor pressure rather than the lowering of the surface tension since both substances lower surface tension while only alcohol raises the vapor pressure.

Effect of Vapor Pressure

Since an increase in vapor pressure seems to be a necessity for a good unplugging action, the effect of this factor was studied by treating a core with ethyl alcohol, methyl alcohol, acetone, and an acetone-ether mixture containing 10 per cent ethyl ether. The vapor pressures of these liquids in cm. of Hg. at 20° C. are respectively 4.5, 8.9, 18.0 and 20.5. The latter value was estimated from Raoult's law. The vapor pressure of water at the same temperature is 1.74 cm. Hg.

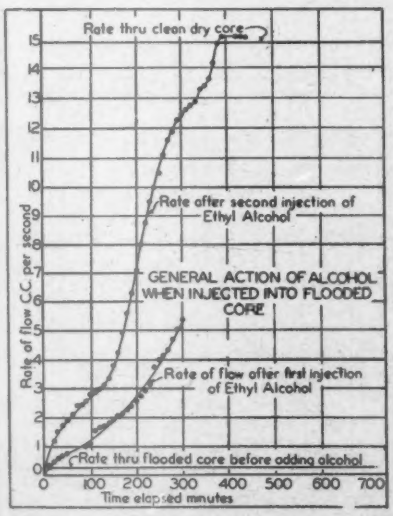
Rate thru clean dry core
Rate after second injection of Ethyl Alcohol
GENERAL ACTION OF ALCOHOL WHEN INJECTED INTO FLOODED CORE
Rate of flow after first injection of Ethyl Alcohol
Rate thru flooded core before adding alcohol
Rate of flow CC per second
Time elapsed minutes
0 100 200 300 400 500 600 700

Fig. 5

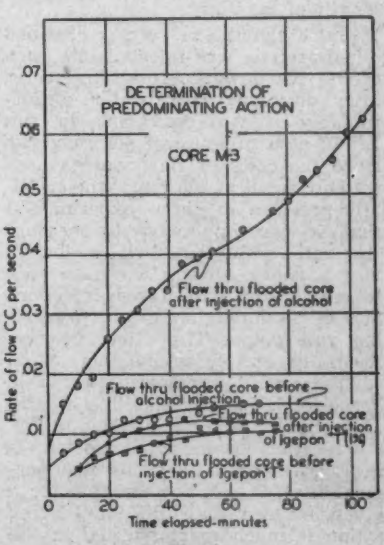
DETERMINATION OF PREDOMINATING ACTION
CORE M-3
Flow thru flooded core after injection of alcohol
Flow thru flooded core before alcohol injection
Flow thru flooded core after injection of Igepon T (1%)
Flow thru flooded core before injection of Igepon T
Rate of flow CC per second
Time elapsed-minutes
0 20 40 60 80 100

Fig. 6

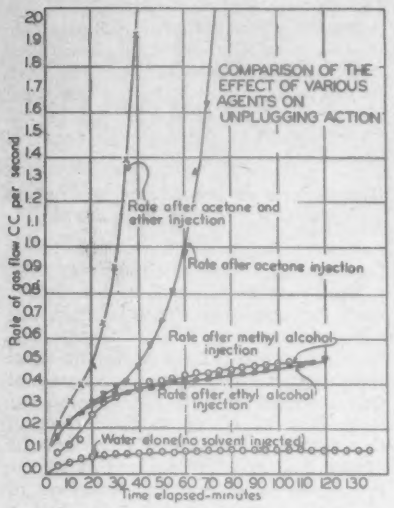
COMPARISON OF THE EFFECT OF VARIOUS AGENTS ON UNPLUGGING ACTION
Rate after acetone and ether injection
Rate after acetone injection
Rate after methyl alcohol injection
Rate after ethyl alcohol injection
Water alone(no solvent injected)
Rate of gas flow CC per second
Time elapsed-minutes

Fig. 7

Fig. 7 gives the results of these tests and with the exception of the peculiar behavior of methyl and ethyl alcohol, the rate of the unplugging action seems to vary as some direct function of the vapor pressures of the treating liquid. The acetone and acetone-ether treatments are especially gratifying.

Effect of Permeability

Since the lower the permeability of a sand the smaller the capillary size, Equation 6 predicts that Jamin action will be most marked (the breakdown pressure gradient would be greatest) in a low permeability sand. This is because a smaller capillary size means a larger value for the parenthetical expression in Equation 6. In addition to this, n will also be greater in a low permeability sand because of the larger number of constrictions and expansions in a given length of capillary.

Fig. 8 shows the results obtained when acetone was injected into each of the two lower permeability cores after drowning with water. Unfortunately it was necessary to run LH-10 at a pressure of 400 mm. Hg. since the rates of flow were so extremely small at 200 mm., (the standard pressure in these experiments) that it was impossible to measure the rate with the flow meter. It will be noted that it was necessary to give core LH-5 three injections of acetone to obtain a rapidly ascending rate curve. The effect of permeability on the unplugging action can be seen by comparing the rate curve for LH-5 (permeability 16 md.) after the first acetone injection in Fig. 8 with the acetone injection curves in Fig. 7 (core M-9 of 34 md. permeability). It can be seen that for a given elapsed time the unplugging action is much more marked in the higher permeability core.

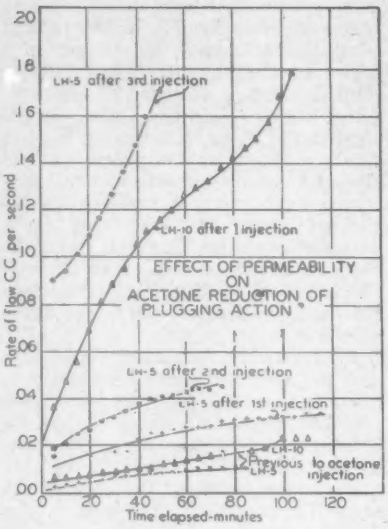

Fig. 8

Effect of Humidity of Gas on Unplugging Action

In some cases in the field, the gas may contain an appreciable amount of water vapor and it would be of importance to know what effect it would have on the unplugging action. Fig. 9 shows the results of a test made with core M-9 in which the gas passing through the core had been previously bubbled through distilled water and was, therefore, in a saturated condition before entering the sand. The curves show that the moisture-free gas is more effective in removing the Jamin plug than the moist gas. This is to be expected since the unplugging process requires a removal of water and a moisture-free gas will take on more water than one already containing water vapor. Nevertheless, even though the gas does contain considerable moisture, it still has a capacity for removal of the solution from the sand. This is perhaps chiefly due to the sharp pressure drop in the immediate vicinity of the well, causing the gas to expand and giving it a greater capacity for moisture than it would have at the higher pressure at a distance from the well.

Effect of Salt Water on Unplugging Action

In many cases the drowning action on gas wells is due to the penetration of connate water into the producing horizon. Consequently the effect of the dissolved salts in the water on the results of an unplugging treatment should be known. Since acetone and methyl and ethyl alcohol have an unlimited solubility in water, whereas, salts of the type found in connate water have a limited solubility in water, a still lower solubility in alcohol-water or acetone-water solutions, there may be a precipitation of salt when acetone or alcohol is added to a brine. A 30-cc. sample of a synthetic gas-field brine was titrated with acetone previous to flooding the core with this particular brine. It was found that 9.4 cc. of acetone were required to start the precipitation of the dissolved salts. Fig. 10 is the plotted data obtained from treating a brine flooded core (M-9) with acetone compared with similar data for the same core flooded with distilled water. It appears that as far as the general action is concerned, acetone unplugs a brine-flooded core as effectively as it does a water-flooded core; however, since the process is chiefly one of evaporation, it is reasonable to expect that whatever salts are in solution in the drowning water will remain as a deposit in the sand after evaporation of the water. Therefore, some decrease in permeability should

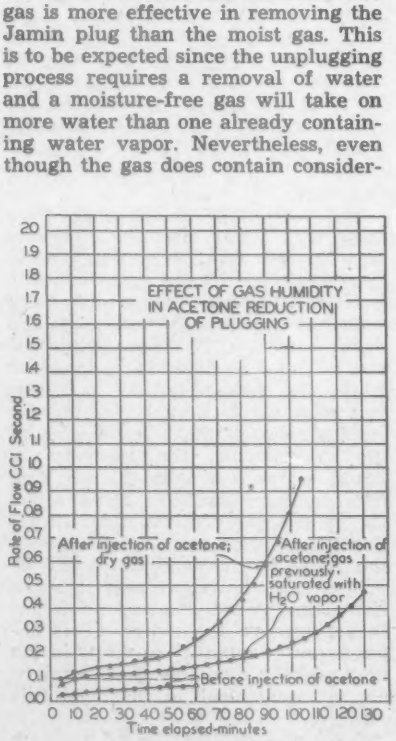
EFFECT OF GAS HUMIDITY IN ACETONE REDUCTION OF PLUGGING
After injection of acetone; dry gas
After injection of acetone; gas previously saturated with H_2O vapor
Before injection of acetone
Rate of Flow CC/ Second
Time elapsed-minutes

Fig. 9

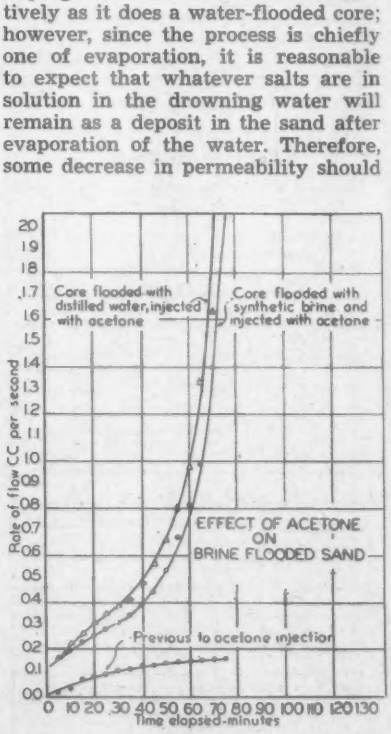
Core flooded with distilled water, injected with acetone
Core flooded with synthetic brine and injected with acetone
EFFECT OF ACETONE ON BRINE FLOODED SAND
Previous to acetone injection
Rate of flow CC per second
Time elapsed-minutes

Fig. 10

take place. Previous to flooding with salt water, the core had a permeability of 34.4 md.; whereas, after flooding and evaporation of the water, the permeability had decreased to 28 md., a decrease of 24.4 per cent. Since precipitation of salts takes place when brines are mixed with alcohols or acetone, it is to be expected that there would be an increased resistance to the displacement of liquids as such and a somewhat further retardation of the unplugging process.

Comparison of Natural Gas With Nitrogen

Nitrogen was used in all these experiments for the sake of convenience and safety. However, the gas which is actually involved in the problem is natural gas. Not only does natural gas show a more rapid response to treatment but, in addition, the Jamin action is not as intense in the drowned sand.

Nature of the Action of the Treating Liquids

The question naturally arises at this point as to what is the mechanism of the action which brings back the rate of flow in a drowned sand. On the basis of Raoult's law, the vapor pressure of water in an ideal solution is decreased by the presence of a second liquid. According to Raoult's law:

$$p = Px \tag{7}$$

where p is the partial vapor pressure of the particular component above the surface of the liquid mixture, P is the vapor pressure of the pure substance at the given temperature, and x is the mole fraction of the component in the mixture. Since x is always less than one in a mixture, p is less than P and the partial vapor pressure of a component in an ideal mixture is less than in the pure state at the same temperature. However, the vapor pressure of a mixture can be greater than the vapor pressure of one of its components in the pure state. Fig. 11 shows the vapor pressure of acetone-water mixtures and the partial vapor pressure of water for comparison. These curves were constructed from data taken from the International Critical Tables. As a mixture of acetone and water evaporates, the most volatile constituent (acetone in this case) passes off in greatest proportion. The vapor pressure of the mixture should therefore decrease as the process of vaporization proceeds. This will tend to slow down the rate of liquid removal. This change in vapor pressure with composition is shown in Fig. 11. In the case of acetone-water mixtures, the partial pressure of the water is slightly greater than that of pure water at the same temperature due to the departure of the mixture from ideal behavior. This is advantageous since it aids in the removal of the water from the producing formation. It is the increase in vapor pressure of the mixture over that of the pure water which seems to be the important fact in the unplugging process. The gas, in penetrating such a mixture contained in the pores of a sand, creates a surface from which evaporation can take place. If the evaporation is rapid, the size and number of channels available for gas conduction will be increased; this in turn increases the rate of gas flow for a given pressure gradient. This increase in flow means that there is more gas available to carry off the liquid which is in the sand. The process is in effect self-accelerating.

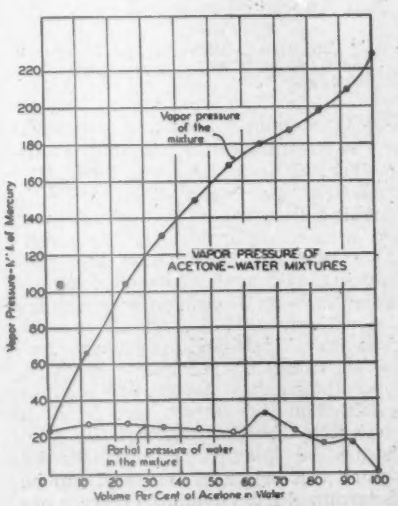

Fig. 11

It should be kept in mind that surface tension does play a small part in the process since the penetration of the gas into capillaries is controlled by it. Equation 3 gives this pressure of penetration which is directly proportional to the surface tension. The greater the surface tension, the greater the pressure necessary for penetration. The lower the surface tension, the greater the number of capillaries penetrated for a given pressure since it will bring some of the smaller radii into action. It is fortunate that the higher-vapor-pressure liquids which are miscible with water also lower its surface tension.

Discussion of Results

Although these results on the revival of drowned gas wells appear to be quite promising from a laboratory standpoint, great caution should be used in applying the knowledge in the field. Sand conditions may be very complex, involving a heterogeneous permeability profile and horizontal variations in permeability. The size of the laboratory sand bed is extremely small as compared with that existing in the field and it is difficult to translate the small-scale experiments directly to the field. Moreover, in applying this knowledge it would be well to estimate, for example, the quantity of water which has penetrated the sand body and how far in it has gone. Such information will be a guide for the treating process. It should be remembered that the treating liquid must mix with the water in the sand and in order to do this it must penetrate. If the liquid does not penetrate the formation easily, it will be necessary to force it in with a gas pressure supplied by a compressor or a high-pressure gas line. It is also more effective if it is forced in for some distance.

Future Role of Oil Fuels

(Continued from page 56)

A great deal of attention has been paid in recent years to the use of addition agents to improve the cetane number or ignition quality of fuels otherwise poor in that specification. Table 2 shows the magnitude of cetane number improvement obtained by adding 0.5 volume per cent of the different chemicals to diesel fuels. The practicability of using these materials hinges both on their market price and their effect on other properties of the fuels, such as flash and fire points, stability, etc. Table 6 shows the effect of one of these, amyl nitrate—which gives 8.9 cetane number improvement with 0.5 per cent in a given stock—on cracked distillates from representative Mid-Continent, Pennsylvania and Illinois crudes. With cetane numbers of 26, 34.5, and 32 it requires 2 per cent, ¼ per cent, and ½ per cent, respectively, to bring these fuels up to 40 or slightly above. To reach about 45 cetane number requires 3 per cent for the Illinois stock, about 1½ per cent for the Mid-Continent stock and only ½ per cent for the Pennsylvania fuel.

Solvent Extraction to Improve Fuels

Similarly, the cetane number, composition and stability of diesel fuel stocks may be improved by extraction with selective solvents which remove the more soluble, more aromatic and naphthenic components from the high cetane, paraffinic materials. Stocks may have cetane numbers increased from 5 to 15 depending on the extraction loss and the general nature of the raw stock, with losses of from 20 per cent to 45 per cent, according to test results (The Oil and Gas Journal, Dec. 9, 1943, p. 34). The final cost is determined by these items in the light of market and economic conditions at any given time. Based on typical assumed values and prices the cost per cetane number per gallon increase may vary from 0.24 cent to practically 1 cent, the latter being generally prohibitive.

A comparatively bright spot, in some phases, is found in the prospect

of catalytically cracked recycle stocks as compared to thermally cracked stocks. Cetane levels of thermally cracked stocks are shown in Table 3. In Table 8 are the changes in cetane number when virgin stocks are passed through a catalytic cracking unit (most of the data are from Houdry recycle stocks). Observing the ratings of the cracked material, only one is below the "middle 40's" range, and that has only a 37 rating in the straightrun stock, unsatisfactory originally. From these data it appears that engines designed to operate on 45 cetane number will find little, if any, trouble traceable to ignition property in handling any of these fuels. The decision and choice of fuels then would be made on the basis of stability or other qualities which are important to the consumer.

Summarizing, it appears reasonable that the engine designer who builds for a cetane number of around 45 need expect no difficulty in obtaining fuels which are satisfactory at current, nonpremium prices and in reasonably adequate quantities. Those who demand premium ignition quality fuels must pay for them, probably at a considerably greater premium than theretofore. Ignition quality per se has been sadly overemphasized, and straining to obtain too high cetane-number fuels entails costs out of all proportion to the advantages received.

A.P.I. ABSTRACTS

The accompanying abstracts are of three papers presented at the meeting of the A.P.I. production division, eastern district, Columbus, Ohio, April 13-14.

Some Recent Advances In Well-Treating Methods And Equipment

P. E. FITZGERALD, Dowell, Inc.

THERE is described an electrically operated interface locator called the electric pilot which locates the contact point of different solutions by means of measured differences in conductivity. This device, when used in a well, locates and records at the surface on an indicator, the location of salt water-oil contact or acid-oil contact. The interface locator can be used to determine relative values of permeable zones by obtaining quantitative measurement of fluid pumped into zones tested. It is also used in selective acidizing to keep the operator informed as to the exact location of the oil-acid level and by controlling it selected zones can be acidized.

In selective acidizing operations the unit is seated in a standard seating nipple installed on the bottom of the tubing. The electrodes extend beyond the end of the tubing to a point near the top of the zone to be acidized. The chemicals are pumped down the tubing, through the passages in the body of the unit and into the well below the electrodes. Oil is pumped down the casing simultaneously. In this manner an acid-oil interface is maintained and by varying the relative pumping rates of the acid and oil, as determined by the electrical meter deflections, the position of the acid in the well is accurately controlled. This assures the introduction of the chemicals into the previously selected zones.

It is in the selection of the pay zones to be acidized that this instrument also performs an important function. It has always been the practice to rely upon various types of logs for the location of the zones of saturation. All of the many logging techniques provide valuable data, but many times the data are incomplete, missing or improperly interpreted. The continued study of the possible applications of the interface locator to well logging led to its most interesting and perhaps most valuable use, the accurate location and evaluation of the permeable zones in a well.

In making well profiles with this device the usual procedure is to introduce enough salt water to cover the section to be surveyed and then to force this fluid into the formation at a constant rate by following it with oil. The rate of fall of the salt water-oil interface is determined by the interface locator. The data obtained are quantitative and when plotted show accurately the position and relative importance of the various permeable zones.

The fluid injection method of well surveying offers definite promise of becoming an important method of securing maximum results from acidizing. Also, it is believed that this technique will provide additional data that will be helpful in improving well-completion methods and workover operations.

Underground Storage Of Natural Gas

E. G. DAHLGREN, Technical Secretary, Research and Coordinating Committee, Interstate Oil Compact Commission, Oklahoma City, Okla.

THE author presents recent information on underground natural gas storage installations throughout the United States and Canada. Descriptive details are given on projects in Arkansas, California, Kansas, Kentucky, Michigan, New Mexico, New York, Ohio, Oklahoma, Pennsylvania, Texas, West Virginia, and Alberta, Canada.

He quotes estimate of 50 or more projects in operation with storage capacity of 135,000,000,000 cu. ft. and delivering capacity of 750,000,000 cu. ft. per day, and points out advantages of the utilization of underground storage.

Wherever available, the discussion of individual projects includes maps, records of testing procedures, data on sand conditions, original rock pressures, historical record of rates of input and takeout and their effect.

Both sand conditions and operating requirements vary in different parts of the country. Therefore a wide variety of types of projects are described. The principal advantages accruing to operators of these projects are:

1. Seasonal storage of gas during summer months as an auxiliary supply in winter months.
2. Profitable operation of small wells in some areas every day and having gas available for peak demands; thus turning unprofitable small producers into profitable ones.
3. In some cases absorbing fluctuations in demand by letting underground storage "ride on the line."

Methods of Sand Study in The Appalachian Basin

R. E. SHERRILL, University of Pittsburgh, and D. A. BUSCH, Pennsylvania Geological Survey.

THE methods of making individual sand thickness maps in the Appalachian basin are described. The principal problems which arise in making these maps are collection of data, selecting or constructing a suitable base map, correlation and contouring. Although the well logs are poor these problems can be overcome by patient utilization of all records. The individual sand maps are especially useful in secondary recovery operations and in prospecting for new pools. For the latter purpose it is desirable that the origin of the sand bodies be known. The methods by which this origin of the sand can be determined from available records are described.

Bauxite as an Adsorbent, Catalyst, And Catalyst Carrier—Part 2

*by H. L. King, Jr., C. D. Laughlin, and H. M. Gwyn, Jr.**

CATALYTIC desulfurization consists essentially of the high-temperature and low-pressure decomposition of mercaptan sulfur, alkyl sulfides and disulfides to hydrogen sulfide in the presence of activated bauxite catalyst and the subsequent removal of hydrogen sulfide.

Extensive research on the effect of the commonly occurring sulfur compounds on tetraethyl lead susceptibility of gasoline had shown that a marked improvement in lead response was obtained when total sulfur was reduced from 0.25 to 0.05 per cent. By further reduction, below 0.05 per cent sulfur, the response was even more pronounced, a much higher rate of increase being obtained as 0.01 per cent and lower sulfur was reached.

*Porocel Corp.

This is the second and final part of a discussion of bauxite and its uses in petroleum technology as a catalyst and catalyst carrier or support. The first part appeared in last week's issue, and it summed up the application of bauxite in older processes. This installment discusses its application in the newer refining processes.

The bauxite catalyst very readily decomposes those sulfur compounds most objectionable with respect to their effect on tetraethyl lead response, thereby offering to the industry a very attractive desulfurization method. Moreover, the process is applicable to straightrun, natural, polymer and cracked gasolines.

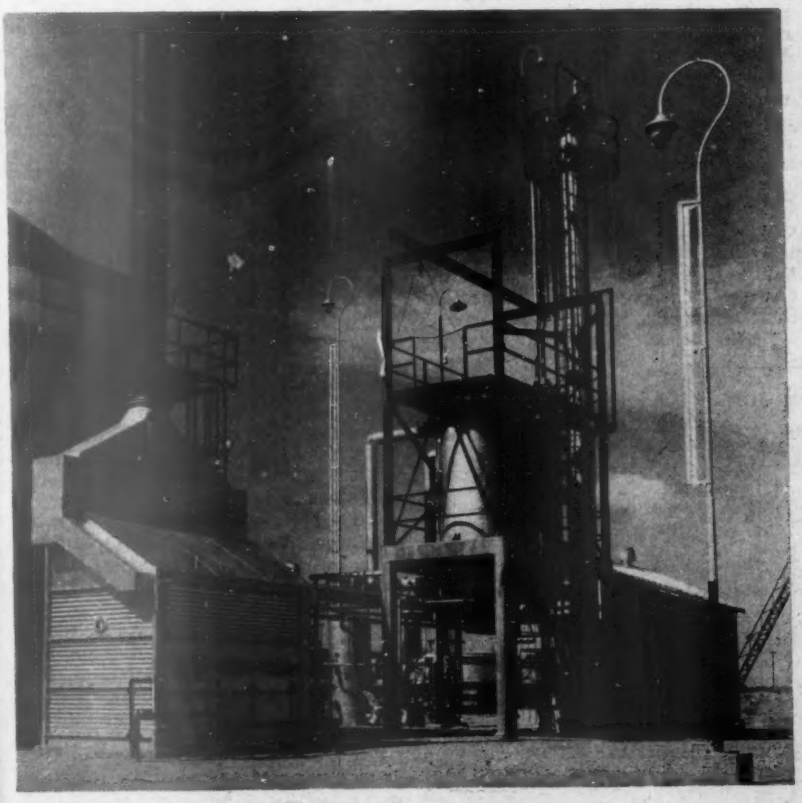

Fig. 7: A bauxite catalytic desulfurization unit. Courtesy Perco Division, Phillips Petroleum Co.

The gasoline to be treated is vaporized in a heat exchanger and pipe heater system and enters the catalyst towers at about 725° F. and at a sufficient pressure to overcome pressure drop through the equipment, usually about 25-35 lb. The treated vapors are cooled in heat exchange against the feed and then pass to an accumulator after being further cooled to 85° F. Depending upon the economics of local conditions, the hydrogen sulfide in the treated product may be removed by a Girbotol unit or caustic wash or it may be passed to a stabilizer where hydrogen sulfide is removed and initial boiling point adjusted.

The catalyst chambers carry 4 to 6 tons of bauxite catalyst per 1,000 bbl. daily capacity. With the exception of the exchanger and cooler where liquid materials containing hydrogen sulfide are present, no special corrosion-resistant materials are necessary.

For units processing straightrun or natural-gasoline products, catalyst life cycles up to 5,000 bbl. throughput per ton of catalyst are obtained. With cracked or polymer gasolines, catalyst life is somewhat shortened, since unsaturates present tend to form refractory compounds with the sulfur resulting from the dissociation of hydrogen sulfide. It is reported that by depressing the dissociation of hydrogen sulfide through the addition of hydrogen, this problem and carbon deposition on the catalyst are greatly minimized.

Generally speaking, the sulfur removed by catalytic desulfurization is 85 per cent or upwards when handling uncracked materials, although reductions of 95 to 98 per cent have been reported.

The improved tetraethyl lead susceptibility of catalytically desulfurized gasolines and naphthas is directly reflected in the amount of high octane blended and ethylized aviation gasoline which can be made from a given quantity of 91-octane commercial isooctane. In the case of a pentane-free natural gasoline, this amount was increased as follows by desulfurization:

87 octane number with 1.0 cc. TEL	52.2%
92 octane number with 0.5 cc. TEL	19.7%
100 octane number with 3.0 cc. TEL	27.7%

Regeneration of the deactivated

catalyst usually is not warranted when processing straightrun or natural gasoline, due to the relatively long active life exhibited; the bauxite catalyst being readily available as a low-cost operating supply.

Sulfur compounds are frequently objectionable in petroleum fractions marketed for purposes other than engine fuels. Technical naphthas, for example, must meet an odor specification. A new process which converts refinery propane is being actively promoted as a source of pure hydrogen for use in hydrogenation of edible oils among other uses. Since extremely small amounts of sulfur in hydrogen used for this purpose are serious, this type of hydrogen-generating unit will probably always include a propane-desulfurization step, which, in the first plant being built, is accomplished by vapor phase bauxite treatment.

Bauxite in the Manufacture of Sulfur From Hydrogen Sulfide and Sulfur Dioxide

The disposal of hydrogen sulfide from sour gas areas and refinery processing of sour crudes is becoming an increasingly important problem and one which will accelerate in importance as the quantities of sour materials handled are increased.

Several concerns have approached the problem by utilizing a modification of the Claus process based upon bauxite as the catalyst. A portion of the hydrogen sulfide containing gas is burned to sulfur dioxide, and the mixture of sulfur dioxide and hydrogen sulfide passed over bauxite at elevated temperatures effecting the reaction $2H_2S + SO_2 \rightarrow 3S + 2H_2O$.

Indications are that catalyst life will be a matter of months, regenerating being effected by burning off any carbon and sulfur formed on the bauxite. Combined with a catalytic desulfurization process, and perhaps a sulfuric acid plant, the process appears potentially attractive to refiners and producers when it becomes necessary to avoid venting sulfur dioxide and hydrogen sulfide to the atmosphere.

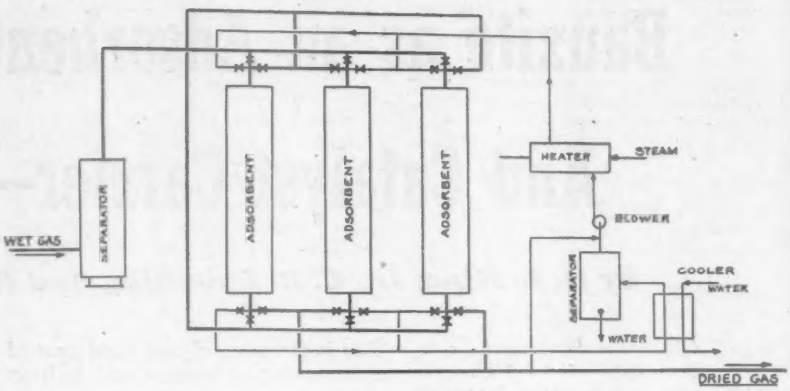

Fig. 9: Typical flow plan—three-tower dryer

Bauxite in Catalytic Cracking, Reforming and Cyclization

The rapid development of catalytic cracking and reforming of gas oils and naphthas has not permitted a clear-cut picture of relative catalyst values, the need for production making cost consideration of secondary importance.

Catalyst losses and catalyst activity degradation in service will become matters of primary import under competitive economic conditions, and bauxite as a source of inexpensive catalysts should come into the picture, due to its ability to withstand high regenerating temperature and resist abrasion, without suffering serious loss of activity.

Recent publications by Phillips Petroleum Co. announcing their Cycloversion process are extremely interesting, the process being able to handle gas oil or selected naphtha charge stocks. When charging naphtha for cyclization purposes, it is claimed that the aviation-gasoline fractions produced contain up to 90 per cent aromatics with only a small amount of olefinic unsaturates. The simplicity and indicated low cost of the process and equipment, and the fact that existing thermal cracking equipment can be readily adapted, should make the process attractive to the refiner weighing the investment for catalytic cracking processes.

The long cycle times, long catalyst service and resistance to poisoning are in part made possible by a rugged catalyst prepared from a selected bauxite ore base. Cyclocel is such a catalyst.

Drying of Gaseous or Liquid Hydrocarbons With Bauxite

Natural gas and refinery process gases and liquids usually carry water to or almost to the saturation point. This water originates in the gas wells and in processing steps where the gas or liquid is brought into contact with steam or other wet process materials. Dehydration is in many cases imperative before successful transportation, further processing or utilization can be accomplished.

The use of solid adsorbent materials, such as Driocel, for drying gases and liquids, has increased in recent years due to the requirements of more exacting process methods and higher operating pressures, calling for materials having the lowest possible moisture content. In natural-gas operations where residue gases are utilized for field repressuring or where wellhead or transmission pressures prevail, the solid adsorbent process provides the means for attaining the low dew points necessary to prevent development of moisture troubles. In refinery processing, liquid propane, butanes and butenes are frequently dried with solid adsorbents. Drying units, for example, form an integral part of the butane isomerization and hydrogen fluoride alkylation plants. This same technique is widely used in the preparation of various refrigerants for industry or for safeguarding refrigerants in refinery practice,

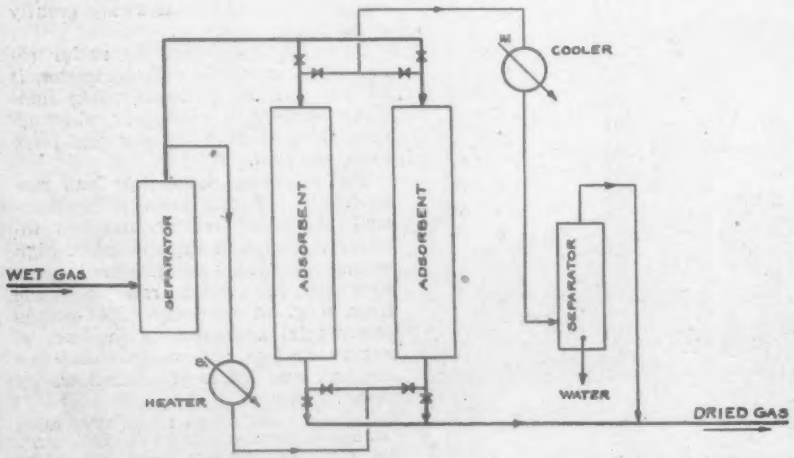

Fig. 8: Typical flow plan—two-tower dryer

either continuously or on an intermittent basis. It is also frequently desirable to eliminate moisture previous to the bottling of butane and propane for industrial or domestic use. Instruments, machines and other equipment actuated by compressed air are frequently benefited by using bone-dry air obtained by adsorbent drying units. Corrosion and line freeze ups are avoided especially where central air compressor stations deliver air to remote locations under cold climatic conditions. Air, used to regenerate certain catalysts upon which water has deleterious effects, can frequently be dried to advantage. Ethylene, benzene, toluene and other pure materials now being produced on a large scale in oil refineries frequently must be dried before further processing. Technical and medicinal grades of white oils and electrical oils are usually purchased on specifications which include water content restrictions. Dissolved water in oils of this character may be readily reduced to a low figure by treatment with a solid drying adsorbent.

Dehydration of natural gas may be necessary for a number of reasons, the more important of which may be enumerated as follows:

1. Prevention of gas hydrate formation.
2. Prevention of internal corrosion in lines or process equipment.
3. Eliminate fouling of valves, compressors, etc., by debris originating from corrosive line conditions.
4. Maintenance of line capacity. (As an alternative to line heating for prevention of hydrate formation and freeze ups.)
5. Prevent reintroduction of water to formations in repressuring operations.

The capacity of a desiccant for the production of dried gas or liquid may be expressed as "Dry Gas Capacity" (D.G.C.). This is the weight of moisture, expressed as per cent of the total desiccant weight, which is adsorbed during the period in which all of the moisture is removed from the material being dried. The dry gas capacity varies with drying conditions, being higher at low drying temperatures and decreasing as the concentration of moisture in the charge becomes lower. For example, a D.G.C. value of 4 per cent may be obtained at 80° F. when the charge has a relative humidity of 10 per cent, compared with a D.G.C. of 10 per cent which would be obtained with a saturated charge. The "Equilibrium Moisture Capacity" of a desiccant is the water in per cent of desiccant weight which will be held when equilibrium has been reached with a moist gas.

In most gas-drying applications, the charge gases are substantially saturated under the existing pressure and temperature. Gases should, therefore, enter the drying unit at as low a temperature as conditions will permit, thereby taking advantage of the lowest possible absolute humidity or moisture load and the higher D.G.C. values incidental to lower adsorption temperatures.

Activated bauxite is commonly used to produce dried gases of extremely low dew point, below —57° F. The drying plant should be relieved of the unnecessary load which would be imposed upon it by any entrained water or oil distillates in the feed. The efficient separation of these entrained liquids and of any sediment which may be carried by the gas will contribute to maximum dryer operating efficiency. Small quantities of absorption oil or lube oil mists reaching the desiccant have, in themselves, little effect on dryer operation; however, long continued contact of these oils with the active desiccant will in time form deposits of a gummy nature which will coat the granules.

In general, traces of gaseous impurities in the feed do not constitute a serious factor. Drying operations are being successfully conducted on gases carrying hydrogen sulfide in the amount of 3 grains per 100 cu. ft. Low-iron bauxite is being used for drying hydrogen sulfide (50 to 80 per cent sulfide by volume) with satisfactory results.

The pressure drop through a well-made granular desiccant is relatively low, and to obtain in operation the maximum D.G.C. values of which the desiccant is capable, it is desirable in plant design to take advantage of the full allowable pressure loss which can be assigned to the dryer unit. Tower proportions are selected with this in mind, taking into account, also, the factors of contact time and permissible gas velocity. In any desiccant column the adsorbent at the charge inlet becomes more nearly saturated with water than subsequent incremental layers and approaches or reaches the point of equilibrium moisture capacity. It therefore follows that, within the limitations given, the predisposition of the desiccant which will cause the greatest percentage of tower charge to reach or approach the equilibrium condition will be best from the standpoint of calculated D.G.C. The 2 to 3 per cent increase in D.G.C. value which can thus be obtained by manipulation of tower proportions greatly extends the on-stream part of the dryer operating cycle; and the increase in water to be desorbed during regeneration adds little to regeneration cost per cycle. Any extension of the on-stream time is directly reflected in lower operating costs incident to reduced operator attention and saving in regeneration heat as measured by that required for the repeated elevation of tower and contents to regeneration temperature. A longer over-all adsorbent life is also indicated, since this to some extent is related to the number of regenerations.

A higher D.G.C. is attainable with the finer-mesh materials, and this fact should be taken into account in selecting the mesh size to use. To the extent which pressure drop considerations will permit, the finest adaptable mesh size should be used. A low iron content of the bauxite desiccant is an aid to the maintenance of good D.G.C. values through a large number of regenerations.

The following ranges of operating conditions are frequently met in practice and afford near optimum adsorption:

1. Temperature of entering gas . . 50° to 90° F.
2. Operating pressure . . . Atmos. to 1,200 p.s.i.
3. Moisture range of entering gases:
   Relative humidity (80° F.) . . 70 to 100%
   Dew point . . . . . 50° to 80° F.

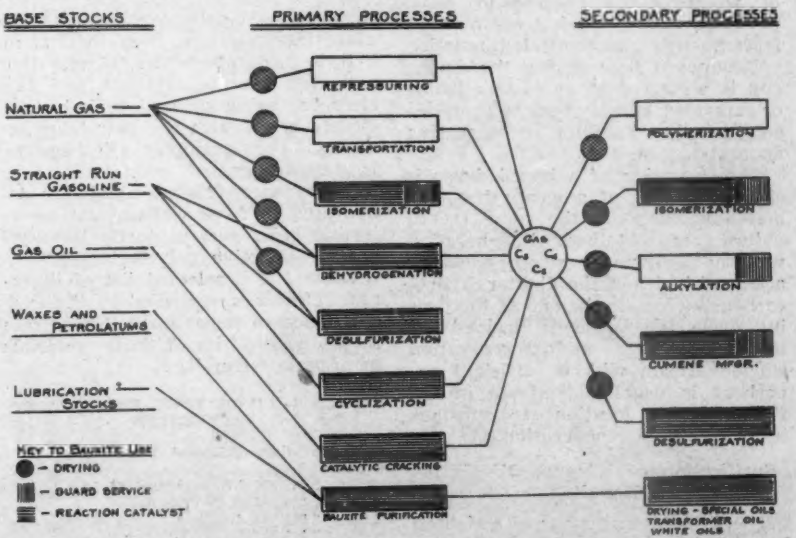

Fig. 10: Applications of bauxite in petroleum hydrocarbon processes

4. Tower diam. to height ratio..1 to 3 or more
5. Impurities in entering gases .....Traces
6. Regenerative gas temps. ...300° to 500° F.
7. Cycle length .....12 to 36 hours

Under the above conditions and at reasonable gas velocities, Driocel will, for example, exhibit a D.G.C. of approximately 10 per cent. After repeated regenerations, an ultimate D.G.C. value 85 per cent to 90 per cent of the initial value is reached. In plant design, a value of 5 per cent D.G.C. is usual to allow the necessary safety factor and to take into consideration the frequently undetermined effects of feed impurities and other unpredictable operational hazards.

Any available sweet gas may be used for regeneration of the desiccant. The temperature of regeneration is usually determined by the pressure of available steam, and in plant design care should be taken to furnish adequate heater capacity. Temperatures up to 500° F. may be used to advantage without deleterious effect on moisture-adsorbing qualities. In general, the higher temperatures result in more complete removal of adsorbed moisture. Granular desiccants may also be regenerated in some cases with superheated steam up to 450-500° F. Direct steam heating is followed by a hot-air purging to complete the last stages of flash drying. In regenerating with gas where the amount of gas for this purpose is limited, a closed regenerating circuit may be used, the water leaving the closed system via a cooler and water separator.

Typical flow plans for two-tower and three-tower solid adsorbent dryers are shown in Figs. 8 and 9. Permissible pressure drop through the dryer and the quantity and temperature of available regeneration gas are usually the factors which dictate the number and proportions of the towers. The use of three towers, two of which would operate in series while the third is being regenerated, is frequently recommended practice.

Downward flow during the drying run is preferred to avoid any lifting or carryover of adsorbent to compressors or other handling or measuring apparatus.

The operation of a liquid dryer is similar to that of a gas-drying unit and approximately the same D.G.C. values are obtained. Regeneration with hot butane or steam is easily accomplished for the lighter hydrocarbon liquids. At the end of the drying cycle the liquid is drained off to wet storage and regeneration started. Steam with a sufficient superheat is usually available in refinery drying locations to substantially complete regeneration.

Purification of Mineral Oils With Bauxite

The first extensive use of activated bauxite by the petroleum industry was in the decolorization and finish brightening of lubricating oils. Within a few years after bauxite was introduced, it had almost entirely replaced fullers earth for this purpose in the finishing of Pennsylvania-grade lube oils.

This relatively rapid acceptance of bauxite by the Pennsylvania refiners was due both to the improved quality of bauxite-filtered oils and to decreased adsorbent cost incident to its use. The refining action of bauxite, as gaged by its effect on the finished oils, is to some extent analogous to solvent extraction and is evidenced by a lower Conradson carbon, improved viscosity index, and a better resistance toward oxidation and other deteriorating influences occurring in oils in finished storage. In this respect bauxite has performed an important service in the production of aviation-grade lubricants.

The outstanding characteristic of bauxite when employed in the percolation process, where repeated regeneration for reuse is standard practice, is the resistance which it exhibits toward the degrading effects of high-temperature roasting. Bauxite may be used until the supply is exhausted by the normal handling losses, without a lowering of refining efficiency below the level of economic utility.

In the finish refining of waxes and petrolatums to very rigid odor, color, and taste specification, bauxite has been proven far superior to other adsorbent materials, such as bone char, which were formerly used in this refining operation. Yields of specification products have been tripled or quadrupled by adoption of bauxite.

Indicated Fields of Use for Activated Bauxite

In this article the extensive part played by activated bauxite in the petroleum industry has been pointed out and possible advantages of further applications which are of immediate interest have been mentioned.

It is also interesting to note that activated bauxite catalysts and carriers are being utilized in industries closely allied with the petroleum industry. For example, ethylbenzene is dehydrogenated over bauxite to form styrene; certain alcohols are dehydrated to form olefins, and bauxite has been used to purify isobutylene by selective polymerization.

Table 1 is a selected list of literature references, compiled by the Porocel research department, to indicate future possibilities of these materials in organic technology.

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Committee Reports Available

The reports of the subcommittee on oil-engine power cost, of the American Society of Mechanical Engineers for the year 1943, is now available. The report on stationary diesels includes information from 160 oil-engine generating plants containing 467 engines totaling 315,102 rated brake horsepower. Data on automotive engines include detailed information from 14 owners and operators of diesel-powered buses and trucks totaling 1,057 vehicles. Address A.S.M.E., 29 West Thirty-ninth St., New York.

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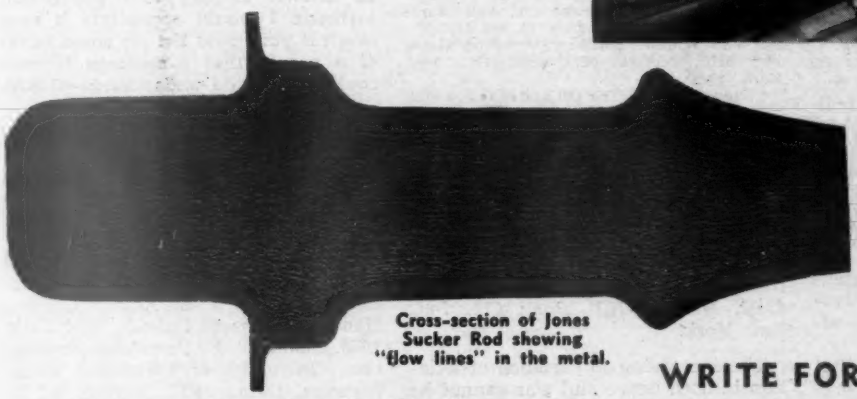

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QUESTIONS on TECHNOLOGY

by W. L. Nelson

Density of Propylene

In connection with a recent item on your page you gave the weight of propylene as 5.07 lb. per gallon, whereas my best references show 4.37 lb. per gallon. If this is indeed an error, then of course the last two columns are equally inflated.—E.K.

The Technical Question (1) of February 24, page 106, entitled "Quality of Butane Gases from Refineries," is under consideration. This question contains a tabulation of various gases, including propylene, showing molecular weight, pounds per gallon, B.t.u. per pound and B.t.u. per gallon. If indeed the pounds per gallon of propylene is in error, the last column, i.e., heating-value per gallon, will be in error but the heating-value in B.t.u. per pound (column 4) would not be in error because it is independent of density.

Difficulty always arises in stating the density of materials that are neither typical gases nor typical liquids. The density of propylene given in the tabulation is apparently correct for propylene at or near its boiling point, i.e., —53.8° F. The densities (and pound per gallon) of a liquid propylene is given in the literature as:

Temp.	Sp. gr.	Lb./gal.	Reference
—53.7	.6095	5.07	(2)
—53.9	.6104	5.09	(3)

This department cannot make extensive searches of the technical literature and it is possible that more recent data are available.

It should be noted, however, that these densities are given at the exceedingly low temperature at which propane boils at atmospheric pressure, at a temperature far below the room temperature at which it must be handled commercially. In this respect the data given in the Technical Question of February 24 are somewhat misleading and the room temperature value for propylene should have been used. In order to keep propylene in the liquid state at temperatures above —53°, it is necessary to apply pressure. Under such conditions the densities of liquid propylene are somewhat as shown in the tabulation. Experimental studies may have been conducted but these values were computed by employing the theorem of corresponding states (4) which gives data that are reasonably accurate for most engineering work.

Temperature	Sp. gr. (approx.)	Lb./gal. (approx.)
— 66	.619	5.15
— 53.8	.61	5.08
— 33	.593	4.94
0	.568	4.73
33	.536	4.46
60	.513	4.27
65	.506	4.21
96	.477	3.97
131	.44	3.67
164	.391	3.26
197	.23	1.92

If pure propylene is handled at 60° F. it would weigh about 4.27 lb. per gallon but if mixed with other materials so that it could be handled at lower pressures the weight of the propylene part would be greater and approach even 5.2 lb. per gallon for highly diluted propylene.

The comments stated here also apply to any exceedingly high-pressure liquids.

References

1. Nelson, W. L., The Oil and Gas Journal, page 106, Feb. 2, 1944.
2. Doss, Physical Properties of Principle Hydrocarbons, The Texas Co., and Morehouse, Can. J. of Research, 11, 640 (1934).
3. Van Winkle, Matthew, Aviation Gasoline Mfr., McGraw-Hill Book Co., New York, 1943.
4. Nelson, W. L., The Oil and Gas Journal, page 184, Jan. 27, 1938, Determining Densities of Oils at High Temperatures.

Aviation Gasoline Book

Matthew Van Winkle — Aviation Gasoline Manufacture, Pennsylvania State College Mineral Industries Series. 275 pp., 39 illustrations, 82 tables, $3.00. McGraw-Hill Book Co., Inc., New York.

The increasing importance of aviation in both peace and war cannot be denied. Aviation-fuel manufacture has launched petroleum refiners into a large-scale manufacture of hydrocarbon chemicals, notably isopentane, 2,2,4 trimethyl pentane (alkylate and hydrocodimer) and styrene. Most plant men are familiar with topping, cracking, and oil manufacture, but they are not prepared for the intricacies involved in aviation-gasoline manufacture. This book is a digest of information available in the technical literature.

The conscious effort in Chapter 3 (Specifications) and Chapter 9 (Performance) and throughout the entire book to indicate the operational significance of the test properties of aviation gasoline is creditable. All too frequently our interest in purely technical matters and the intricacies of plant operation, leads us away from the performance of the plant product. This important consideration is not neglected. The chapters on the manufacture of base stocks (5) and antiknock hydrocarbons (6) are perhaps the least satisfactory because published information is meager and because hopes and facts are confusingly interlocked in much of the literature.

With the end of the war the petroleum industry will be confronted with determining the best way of utilizing the enormous manufacturing facilities now producing military fuel. This book contains the background, the seeds of action, for approaching this task. Barring the unlikely development of new type engines which do not need antiknock fuels, much of this equipment will continue to operate for the production of high-octane gasoline, but other parts of the equipment may constitute plants for the postwar manufacture of organic chemicals and the parts of the book that pertain to hydrocarbon manufacture may form in part the process basis for this conversion.

Drilling and Production Books

I have now been given a chance to go into the field for actual field work and I find myself badly lacking in known drilling and production methods. I would appreciate it very much if you could list me some books of a nature that a common layman could digest and understand.—O.B.M.

Books that are simple are somewhat rare because of the complexity of the petroleum industry. Furthermore, the simpler books are not really of much practical value except perhaps in easing the mind of the reader.

The following are standard books in the field of drilling and production: Brantley, J. E., Rotary Drilling Handbook, Russell Palmer, New York, 1936. Cloud, W. F., Petroleum Production, University of Oklahoma Press, Norman, Okla., 1937. Herold, S. C., Analytical Principles of the Production of Oil, Gas and Water, from Wells, Stanford University Press, 1928. Jefffrey, W. H., Deep Well Drilling, Gulf Publishing Co., Houston, 1931. Uren, L. C., Petroleum Production Engineering, 2 Vols., entitled Exploitation and Development, McGraw-Hill Book Co., Inc., New York. Zaba & Doherty, Petroleum Engineers Handbook, Gulf Publishing Co., Houston. Drilling Equipment Directory, The Oil and Gas Journal. Producing Equipment Directory, The Oil and Gas Journal.

One of the best ways of becoming familiar with the industry is to subscribe to a suitable magazine and then examine in the field the types of equipment and operations that are discussed in the articles.

RECOVERING RESIDUAL GAS WITH A ROTARY COMPRESSOR

IN the past it has been common practice to abandon any gas well or group of wells that no longer retained sufficient rock pressure to feed into the existing suction system. Hope Natural Gas Co. was presented with such a problem when approximately 25 of its wells in Mannington district were found to have an average rock pressure of 24 lb. per sq. in., and located a distance of 6 to 10 miles from the main field station. This rock pressure allowed it to feed only a small per cent of their potential output and then at only infrequent intervals. It was decided that the production from these wells could be increased six to eight times if the well-head pressure were reduced continuously to approximately one-third the rock pressure.

Compressor installations to recover residual gas must be low in first cost and require little or no operating supervision and have low maintenance charges. Rotary compressors of the sliding-vane type seem to satisfy these requirements. Electric-motor-driven rotary compressors fully equipped and installed ready for operation, cost only $72 per horsepower. (See Table 1.) Salvage value if moved to a new location would entail a loss of only 10 per cent of original cost.

Total operating cost, including purchased electric power, labor, operating supplies, maintenance and fixed charges (on a 10-year basis) is approximately 2.94 cents per 1,000 cu. ft. (See Table 2.)

TABLE 1—Actual Installation Cost for Four 25-Hp. Rotary Compressors, Mannington, W. Va., District by Hope Natural Gas Co.

4—Fuller single-stage rotary compressors, complete with motor and starter*	$5,696.32
Mercoid pressure and temperature control switches	312.50
Pipe, pipe fittings and electrical equipment	275.01
Foundation timbers	31.31
Buildings (material only)	142.58
Labor and teaming	562.16
Overhead and expense, including taxes	175.03
Total first cost of installation	$7,217.23

*Operating speed 1,160 r.p.m., capacity each unit, 150 cu. ft. free gas per minute against 50 lb. discharge pressure.

TABLE 2—1943 Operating Cost for Four 25-Hp. Rotary Compressors Pumping 258,623,000 Cu. Ft.

	Total cost	Cost per M.c.f. (cents)
Electric power, average 1.44 cents per kwh.	$5,706.67	2.206
Operating labor at $0.94 per hour	171.95	0.066
Lubricating oil	197.00	0.076
Maintenance (equipment and labor)*	5.62	
Fixed charges on $7,217.23 investment (5 per cent interest and 10-year life)	934.63	0.361
Total cost	$7,015.87	2.709

*Abnormal, but estimated over period of years at $600, which would add 0.23 cent, making normal annual per year average cost 2.94 cents per 1,000 cu. ft.

A reciprocating type of compressor, driven by a gas engine of the conventional design, and of a like capacity, would cost something like $150 per horsepower to install. The costs for 100 installed horsepower would be distributed roughly as follows: $7,500 for engines and compressors, $4,000 for piping, building and auxiliary machinery and $3,500 for labor, teaming and other expense. The total cost of installation would be approximately $15,000 or more than twice the cost of installing rotary-type compressors.

The operating expense of the reciprocating compressor is slightly greater, because the services of one operator are required for a full day each day. The maintenance charges are considerably higher as shown by the figures for a representative actual installation as given in Table 3.

TABLE 3—Approximate Operating Cost of 100-Hp. Reciprocating Compressor Plant Based on Pumping 250,000,000 Cu. Ft. Per Year

	Total yearly cost	Cost per M.c.f.
Labor	$2,930.00	.01172
Supplies and expense	608.00	.00243
Maintenance	250.00	.00100
Fuel	2,100.00	.00840
Out-of-pocket cost	$5,888.00	.02355
Fixed charges on $15,000 (5 per cent interest and 15-year life)	1,444.00	.00578
Total cost	$7,332.00	.02933

For the final depletion of the natural-gas reserves of a small group of wells, the rotary compressor has a slight economic advantage due to its low first cost and low maintenance charges. However, its great advantage lies in the fact that the whole installation can be moved at the end of a 1 or 2-year period with only a small loss in invested capital.

This installment of Cost Engineering is an abstract of a paper presented at the meeting last week of the Eastern District, American Petroleum Institute, Division of Production, at Columbus, Ohio. The paper was presented by George W. McKinley, engineer with Hope Natural Gas Co.

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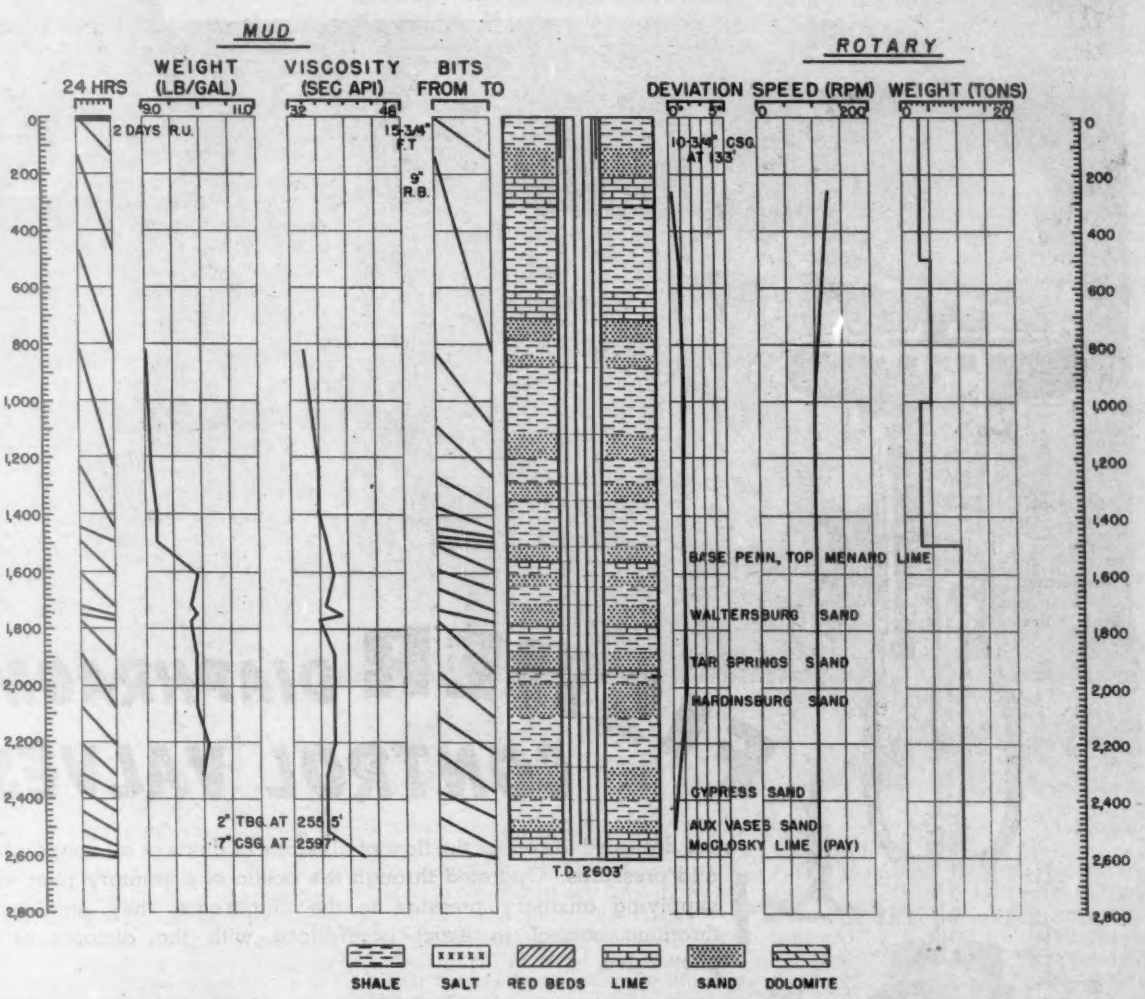

DRILLING DATA

	Days
Rigging up	2
W.O.C.	5
Logging (electric)	1/3
Coring	2
Drill-stem test	2/3
Running casing	1/3
Trips	3
Total rotary time	21

BITS USED

Type—	Number	Size (in.)
Fish tail	1	15¾
Rock bit	20	9
Core heads	3	7
Core heads	3	6¾

CASING AND TUBING RECORD

Size (in.)	Weight (lb.-ft.)	Depth (ft.)	Cement (sacks)
10¾	32.75	133	125
7	24.0	2,597	625
2	4.7	2,555	

MUD USED

Aquagel	71 sacks
Smentox	1 sack
Quebracho	50 lb.

COMPLETION

Gun perforating, hr.	18
Size shots, in.	9/16
Number shots	57
Acidizing, hr.	6
Amount acid, gal.	2,205

PRODUCTION TEST

Time flowed, hr.	24
Choke	none
Oil, bbl.	332
Water	none
Gravity, A.P.I. at 60°	38

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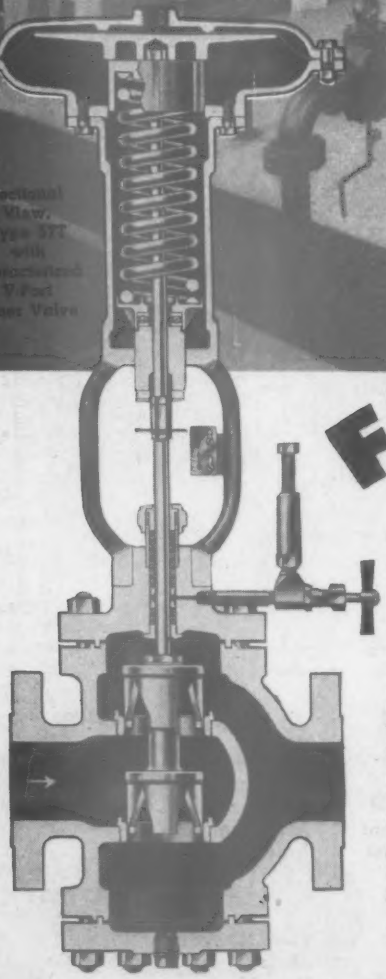

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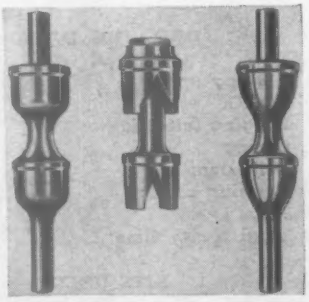


FISHER GOVERNOR COMPANY, 262 FISHER BLDG. MARSHALLTOWN, IOWA

REFINING

Refinery at Whitehorse to Be Dedicated April 30

EDMONTON, Alta. — April 30 has been selected as the date for dedication of the refinery at Whitehorse, Yukon Territory, constructed by the U. S. Army's Northwest Service Command to process crude from Canada's sub-Arctic regions. Brig. Gen. Ludson D. Worsham, commander, said in announcing the date that operation of the plant will mark the final step in the Northwest Service Command's mission to provide Alaska with a defense route and materials for defending the northwest coastal area of Canada and Alaska.

Oil from the Norman Wells field, across the Mackenzie Mountain Range in the Mackenzie River Valley, is being carried to Whitehorse through the 595-mile pipe line. Products from the Whitehorse refinery can be distributed by a network of pipe lines to airports along the Alaska Highway, to the coast at Skagway, Alaska, for redistribution, or to Fairbanks, in inland Alaska.

The Northwest Service Command's mission was to open an inland route to Alaska and to supply the route with petroleum products from a source which could not be attacked by an enemy from the sea.

"All these projects — the Alaska Highway, the Canol project and the Alaska communications system — are designed to carry the war to the enemy by supplying all essentials to the U. S. Army Air Forces on this northwest route," General Worsham said. "With completion of several permanent bridges on the Alaska Highway this summer, the Northwest Service Command's task will be maintenance and operation."

Used Underground Vessels Are Exempted by OPA

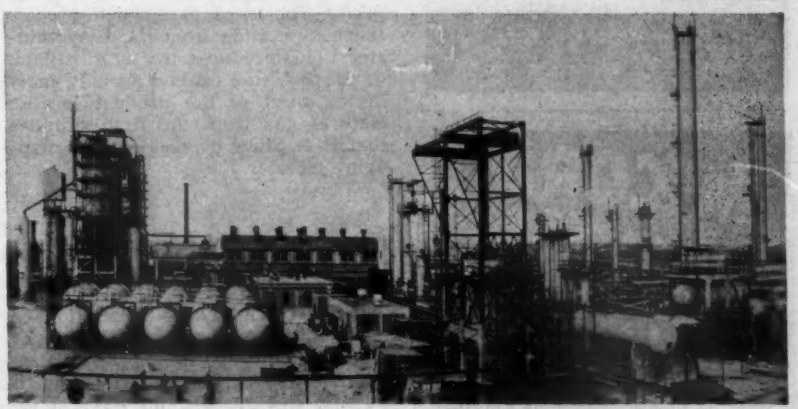
WASHINGTON. — Sales of used pressure vessels and enclosed atmospheric pressure vessels which are installed underground and are purchased for use in their existing location were exempted from price control April 7 by Office of Price Administration.

Most of the vessels affected are used for storage of petroleum products, James F. Brownlee, acting administrator, explained. Regulations of Petroleum Administration for War require an outgoing supplier to sell his equipment to incoming suppliers. However, in such a sale it is often difficult to determine the maximum price for a buried vessel. It is impossible to determine the costs, size, thickness, type, kind of material, etc., and original records are often unavailable.

Prices long established by petroleum marketers are generally lower than the maximum prices established by the regulation. Further, under the regulations most companies buy buried vessels as often as they sell them. In view of these facts, Brownlee said, exemption of sales from price control will not have an inflationary effect.

FRONTIER PLANT NOW HELPING WAR EFFORT

FRONTIER REFINING CO.'s new 100-octane gasoline plant at Cheyenne, Wyo., was dedicated April 15, with Gov. Lester C. Hunt; J. Howard Marshall, assistant deputy and chief counsel for Petroleum Administration for War; Dr. Gustav Egloff, director of research for Universal Products Co., Chicago, and M. H. Robineau, president of Frontier, as speakers. A congratulatory message from U. S. Senator Joseph C. O'Mahoney, Wyoming, was read. Bombers from the Cheyenne airport circled overhead, emphasizing the need for unlimited quantities of aviation gasoline.



The accompanying panoramic view shows major units of the big plant, which now is contributing to the war effort. The photograph, taken from atop the cooling tower, does not show the 12,000,000-gal. storage area located on the far side of the refinery grounds. Frontier's original refinery is close to the new plant. When this picture was taken, four of the seven operating units were in action and the three others were being tested out, preparatory to complete operational schedules. This Government-financed plant is one of three in the Rocky Mountain area drawing on adjacent crude supplies to make aviation gasoline.

The four men pictured below are among Frontier executives who have taken an important part in construction of the new plant. Robineau is president; Newman, vice president (refining); Burns, in charge of the plant's operations; Armitage, vice president (administration).

M. H. ROBINEAU W. R. NEWMAN WELDON B. BURNS H. E. ARMITAGE

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Construction of Refinery Begun at Glasgow, Ky.

GLASGOW, Ky.—Work has started on construction of a refinery a mile east of here on Highway 63, by W. W. Plowman and J. E. Cruise, Salem, Ind., and J. C. Potter, Dallas, Tex., who have other refineries in Indiana. The new plant will have a daily capacity of 1,000 bbl. and is expected to be ready for operation in 45 days.

Plowman said that while present available production from nearby fields was inadequate for requirements of the refinery, there were indications of extensive drilling operations and that until production was increased, crude oil could be obtained on a trade-out with Ashland Pipe Line Co.

Expansion Is Planned for Lloydminster Refineries

LLOYDMINSTER, Sask. — Expansion is planned for the one-still plant of Lloydminster Refineries by addition of a second 700-bbl. still and installation of an electrical dehydrating and desalting unit of 1,200-bbl. capacity. The plant, designed to process the heavy crude from the Lloydminster field, produces tractor distillate, diesel fuel, fuel oil and asphalt, marketing most of the product locally. Natural gas from the field supplies fuel. R. L. Shaw is president and managing director.

McBride Plant Increases Its Output 20 Per Cent

EDINBURG, Tex. — Installation of new equipment at the plant of McBride Refining Co. in La Blanca gas-distillate field, eastern Hidalgo County, has stepped up its production capacity 20 per cent, executives of the company announce. The plant's daily crude runs to stills are now 700 bbl. instead of 600. H. L. McBride, president, said most of the unit's yield would be in oil solvents.

Construction of High-Octane Plant Halted by Strike

LOS ANGELES.—Settlement of a labor dispute ended last week after construction of the 100-octane refinery for General Petroleum Corp. at Torrance had been halted for a day by a strike of 1,100 members of 15 unions affiliated with American Federation of Labor.

In announcing that adjustments had been reached, A. L. Mashburn, secretary of the Building and Construction Trades Council, said that employes on construction of the plant intended to produce gasoline for the Army and Navy in the Pacific war against the Japanese, were asked to return immediately to their posts.

The 1-day strike was called when a four-man, nonunion crew of the Southern California Edison Co. began erection of a substation at the plant to feed electric power to the project.

Construction Director George F. Prussing of the Petroleum Administration for War said the Edison company had advised union representatives it could not supply an all-union crew for the power line job which, Prussing added, involves only a dozen men and would require only a week to complete.

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DEOXIDIZED Bessemer Steel is not meant to wholly supplant other steels for tubular products; there are some cases where other steels may serve equally well, or better. It is merely another in the great steel family which will be preferred for many pipe applications simply because, for such applications, it has particular merit.

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PIPE LINES

Gasoline Shipments Increase Through WEP 20-in. Line

Throughput of War Emergency Pipelines, Inc.'s 20-in. products line continued at the rate of approximately 180,000 bbl. daily during the past week. The WEP program calls for maintaining shipments at nearly this rate with increasing amounts of gasoline and a decreasing proportion of heating oil. Two grades of gasoline are now being handled: house brand, 72-74 octane, and Navy gasoline, 80 octane; batches of Navy diesel are also moved through the line. The schedule for kerosene movement has been discarded and much of the space in the line formerly allocated to kerosene is now being assigned for house-brand gasoline.

Kansas Consolidated Plans 215-Mile Line

WASHINGTON. — Federal Power Commission has announced receipt of an application, as amended, by Kansas Consolidated Gas Corp., Wichita, Kans., for certificate of public convenience and necessity to install approximately 215 miles of 18-in. natural-gas pipe line to extend from a point in the Hugoton gas field in Stevens County, Kansas, to Wichita, Kans. The company estimates the total cost of the project at $4,996,190. Upon completion of the proposed facilities, the application states the company will engage in the business of purchasing, transporting and selling gas produced in the Hugoton field. The pipe line will take care of a portion of the existing natural-gas shortage in the greater Kansas City and Wichita areas.

According to the application a considerable portion of the gas supplied by means of the proposed facilities will be delivered to Consolidated Gas Utilities Corp., an affiliate which owns and operates, among other facilities, a gas transmission system extending from Wheeler County, Texas, to Lyons, Kans., through the city of Wichita. The basic sources of supply for the Consolidated Gas Utilities Corp.'s system, the application continues, have been depleted to such an extent by the abnormal demands placed upon them by the war emergency as to render them inadequate to serve the present demands. This additional source of supply, the application adds, will enable Consolidated Gas Utilities Corp. to serve fully the retail and wholesale demands upon its system, and the gas made available by the proposed facilities will also be sold, under contracts, to other natural-gas companies to augment the supply of natural gas now available to them and thereby assist them in meeting demands.

Gas to be transported through the proposed line will be obtained from the Hugoton field in Kansas, Oklahoma and Texas. The application states that the company contemplates using to the greatest possible extent existing producing wells through the purchase of gas from producers in the field.

The proposed facilities, according to the application, will include a gas compressor station of 5,600-hp. capacity, to be located at the western terminus of the pipe line in Stevens County, Kansas, approximately 215 miles of 18-in. line extending from the compressor station in a northeasterly direction to a point about 1 mile west of Wichita, about 3 miles of 14-in. pipe line to extend to the Consolidated Gas Utilities Corp.'s Wichita town-border station and its Wichita compressor station, a dehydration plant to be constructed at a strategic point on the main gas transmission line, with a capacity of 90,000,000 cu. ft. per day at a working pressure of 700 lb., and appurtenant facilities. Subject to obtaining the required authorizations and approvals by governmental authorities, the applicant expects to commence construction by July 1, 1944, and to complete construction by December 1, 1944. The applicant estimates that the maximum amount of gas which will be delivered through the facilities on the peak day of any year will be 85,000,000 cu. ft. and that the minimum quantity delivered on any one day will be about 30,000,000 cu. ft.

Texas Pipe Line Co. Starts Illinois Line

For laying 34 miles of 6-in. products line from Lockport, Ill., to East Chicago, Ind., Texas Pipe Line Co. let contract last week to Morrison Construction Co. Contrary to previous reports there will be no 4-in. pipe in the line. Work is starting this week. Completion is scheduled for June.

Preparations Made For Rocky Mountain Lines

To complete in June the 82-mile crude-oil line of 6-in. and 8-in. pipe from the Elk Basin and Frannie pools on the Wyoming-Montana boundary to Billings and Laurel, Mont., it has been considered necessary to have construction get under way this month although weather conditions are still unfavorable.

Aerial surveying for Stanolind Pipe Line Co.'s Elk Basin-Casper, Wyo., line has been delayed because of thick snow along the route this spring and other adverse circumstances. Ground surveys for the line are scheduled to start April 22.

San Diego Seeks Terminal Of Texas-California Project

San Diego, Calif., city officials and the Chamber of Commerce have put in a bid for the western terminal of the proposed 20-in. crude-oil pipe line from Ward County, West Texas, to the Pacific Coast. The proposed crude line would be 986 miles long.

Priorities for the line are being sought by the Pacific War Emergency Pipelines, Inc., organized to construct the line to ward off a threatened shortage of crude oil on the Pacific Coast.

L. N. Glasco of Dallas, secretary-treasurer of the P.W.E.P., has announced that the corporation has dropped plans for federal financing support and that if the line is approved by the Petroleum Administration for War and the War Production Board, it will be built with private capital.

San Diego officials have notified P.W.E.P. that if the city is chosen for the western terminal of the line, it will push either for the construction of a new refinery there or for the removal of a refinery to the city.

All three members of the Texas Railroad Commission have endorsed a proposal for the line to carry 180,000 bbl. of crude daily estimated to cost $50,000,000.

Commissioner Olin Culberson, who accompanied the incorporators to Washington to present their application, said that the saving in railroad freight rates from West Texas would pay for the line in a few years. Present posted freight rates from Monahans to Los Angeles, he said, are $2.95 a barrel. Pipe-line transportation would cost 40 cents a barrel at the most, he estimated.

Culberson said it makes no difference whether the line is built by private enterprise or financed by the Government to be sold later to private companies, but that it is necessary to make available to the Pacific war theater the large amount of oil which West Texas can supply.

Gulf Progresses With Texas Looping Project

In the laying of 88 miles of 8-in. and 10-in. loops on its West Texas line and for a new 28-mile 8-in. line from Big Sandy to Longview, Tex., Gulf Refining Co. has pushed work to attain completion in June or July. Some of the undertaking has been hampered by floods in the Sabine River.

Colonial Beacon Takes Bids For Massachusetts Pipe Line

Colonial Beacon Oil Co. is receiving bids from contractors for 34 miles of 4-in. and 6-in. products pipe line from Everett, in the Boston metropolitan district, to Methuen, Mass. Pipe has been ordered for delivery in the second quarter. Some work is now being done in assembling used materials which may be utilized in the construction of the project. The project should be completed in July.

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YEARS OF EXPERIENCE Only those with years of experience in the construction and reconditioning of oil and gas pipe lines can comply with the modern day demands upon the pipe line contractor. We have had *many* years of such experience.
May we have the opportunity to serve you?

M & C CONSTRUCTION CO.

L. H. "Spec" MORRIS, Pres. PIPE LINE CONTRACTORS B. V. COLLINS, Vice Pres.
513-14 Dan Waggoner Bldg., Fort Worth 2, Texas

BAASH-ROSS TOOL CO.

Baash-Ross News

BAASH-ROSS TOOL COMPANY · LOS ANGELES · HOUSTON · NEW YORK

OIL & GAS JOURNAL EDITION

FOUR things make this one of the riskiest of all rig operations!

When you use drill pipe slips to support a drill collar in the table, you are practically asking for a costly fishing job. Why? Because, compared with ordinary drill pipe, there are *four* factors that add extra risk to handling drill collars . . .

1. HARD SURFACE. The ends of drill collars are heat-treated in the area where the slips take hold. The resulting hard surface makes it far more difficult for slips to get an adequate grip on the collar!

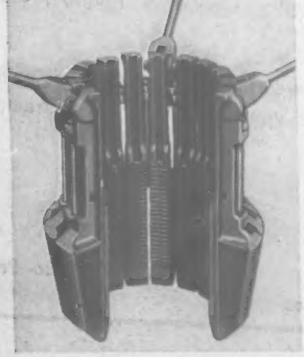
2. NO SHOULDERS. The majority of modern drill collars are made flush top to bottom. This means there are no shoulders to stop the collar from slipping once it has started!

3. VARIABLE DIAMETER. Drill collars, rotating against the abrasive, fresh-cut walls of the hole, rapidly lose diameter. Ordinary fixed curvature slips cannot compensate for this wear, become less and less efficient as collar is used.

4. INSUFFICIENT WEIGHT. All slips depend upon wedging action for grip pressure. When supporting drill collars, usually only the weight of the bottom of the string is available to wedge the slips. This means less effective grip, greater risk of slipping!

BAASH-ROSS DRILL COLLAR SLIPS

ABOVE *"Regular" Type showing how multiple narrow slip segments are flexibly hinged together.* **BELOW** *"Long" Type showing how segments extend above slip area to provide seat for a Baash-Ross Safety Clamp (see page 265 of your 1944 Composite Catalog). Both types have renewable slips for maximum economy.*



Here's the solution . . .

BAASH-ROSS DRILL COLLAR SLIPS!

These slips are *specifically engineered* to eliminate one of the riskiest of all rig operations . . . supporting a drill collar through the table with "fixed diameter" slips.

They differ from ordinary slips in that they are made up of many narrow segments *flexibly hinged together* to insure an adequate, full-diameter grip on the collar at all times and under all conditions. They w-r-a-p around the collar like a chain tong, fitting every inch of the circumference whether the collar is new, old, round or out-of-round!

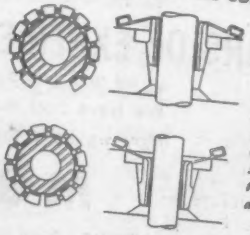
Compare this *full-circumferential* grip with the partial grip provided by ordinary "fixed-diameter" slips . . . that is, slips designed to fit a certain diameter pipe *and that diameter only*. Trouble is, drill collars don't have a "fixed" diameter. Their constant rotation against the abrasive, fresh-cut walls of the hole causes them to wear rapidly. And they not only become smaller in diameter, but often out-of-round as well. Ordinary rigid type slips cannot compensate for this wear (see illustration) . . . consequently grip the collar less and less securely. This reduced gripping area—combined with a hardened surface, insufficient weight and flush construction—make the use of rigid type slips to hold drill collars an invitation for a costly fishing job!

But the Baash-Ross Drill Collar Slips practically eliminate these risks by the full-area grip they take on any drill collar, regardless of its shape or diameter. They are one of the best safeguards you can put on your rig!

TWO TYPES—WIDE RANGE OF SIZES. Baash-Ross Drill Collar Slips are available in two types—"Regular" and "Long." The "Long" type has extensions above the slip surface providing a seat for a Baash-Ross Safety Clamp for *double* protection. Both types have interchangeable liners for long life, low maintenance. Both are available in sizes to fit all diameters of drill collars, each size handling a variation of 1½" in diameter.

Get the full story on this important safeguard from your Baash-Ross dealer, or write direct for bulletin!

BAASH-ROSS DRILL COLLAR SLIPS



When the drill collar is new, the flexible slips rest high in the tapered bowl, giving a full grip. As the drill collar wears, the slips rest lower in the bowl . . . but always give the same full grip.

ORDINARY SLIPS

. . . give adequate grip with new drill collars (A) . . . but give less and less grip as drill collar wears (B)!

Natural Gas

Manufacturers to Buy Lines Of Beaver-Butler Gas Co.

WASHINGTON. — Federal Power Commission has issued an order authorizing The Manufacturers Light & Heat Co., Pittsburgh, to acquire and operate all the facilities now held by William J. Landis and Henry C. Amsler, surviving trustees for creditors of Beaver-Butler Gas Co., Warrendale, Pa.

The properties include approximately 51 miles of field and transmission lines and appurtenant facilities, located in Beaver, Butler and Allegheny counties, Pennsylvania. Manufacturers is to pay the trustees $25,000 in cash. The properties have been operated since 1934 by the trustees and, although the number of customers has been substantially increased, operation has been unprofitable owing largely to excessive line losses. The purchaser proposes to rehabilitate the facilities and thereby reduce or eliminate these losses.

Commission Sets Allowable For Hugoton Gas Field

WICHITA, Kans. — The state Corporation Commission has set an April allowable of 7,948,795,000 cu. ft. for production of natural gas in that part of the big Hugoton field which lies in Kansas, T. A. Morgan, director of the conservation division, announced last week. According to the commission's order, this allowable is the same as the "reasonable market demand" for the month.

An allowable of 6,355,786,000 cu. ft. has been assigned to those wells which already are qualified to receive an allowable. The remaining 1,593,009,000 cu. ft. has been set aside for allocation to those wells which have not yet been qualified. Allowables will be assigned upon compliance by producers with all requirements in the basic order.

New Gas Wells May Permit Kane to Abandon Butane

KANE, Pa. — Increased supply of natural gas from new wells may permit abandonment of the butane-gas system which has been resorted to in emergencies of the past 3 years, gas operators say. More than 225,000 cu. ft. has been piped into local lines daily from two new wells, one in the Mead Run district and the other 6 miles south of Kane.

Separate Corporate Entity of Houston Gulf Gas to End

PHILADELPHIA. — Elimination of Houston Gulf Gas Co. as a separate corporate entity is expected to be effected by a series of proposed transactions on which Securities and Exchange Commission will hold a hearing April 24.

Union Producing Co., according to the plan, will acquire the producing properties of Houston Gulf for $3,049,155 plus an amount equal to expenditures for construction and development of the properties since December 31, 1943.

United Gas Pipe Line Co., as owner of all the outstanding capital stock of Houston Gulf, will merge with the latter company, thus receiving all of its remaining properties.

Plans Studied for Pipe Line To Carbon Black Plants

WASHINGTON. — War Production Board is studying plans looking to construction of a 60-mile natural-gas pipe line in the Texas Panhandle to move natural gas to carbon-black plants now operating below capacity and thus increase the output of this vital product. A substantial increase can be effected by building this pipe line without installation of new equipment, it is said by the chemicals bureau of the board.

It is estimated that an additional 30,000,000 lb. of the easily processed channel black can be obtained annually from present facilities if sufficient gas is available to enable the plants to run at capacity, WPB officials said. The proposed pipe line would furnish at least 60,000,000 cu. ft. of gas a day, which would be enough to produce the 30,000,000 lb., they explained. WPB officials have been told that an additional 100,000,000 cu. ft. of gas a day is available in the West Texas area.

The increased production that would result from construction of the pipe line would be enough to meet the 1944 requirements of the rubber program, however, WPB officials said. They estimated that for the first quarter of 1945 it will be imperative to produce at least 100,000,000 lb. of additional channel carbon black, which will require expansion of existing plants or the construction of new ones.

The total anticipated new production (covering all types of furnace carbon black) equals 107,000,000 lb. The annual production rate is expected to reach 479,000,000 lb. before the end of December, provided all new plants are in operation, WPB said.

Joint Pressure-Maintenance Plant for Luby Proposed

AUSTIN.—Stanolind Oil & Gas Co. and Seaboard Oil Co. of Delaware have made joint application to Railroad Commission of Texas for permission to construct and operate a pressure-maintenance plant in the Luby field, Nueces County, Texas, and to make dual completions of certain wells in connection with this proposed operation. The commission will hold a hearing on the application April 18.

Lower Gas Rate Will Save Galveston $45,000 Yearly

GALVESTON, Tex. — A new city ordinance reducing local gas rates and fixing a new schedule of rates for the city will effect an annual saving of $45,000 to $48,000 for consumers. The lowered rates will go into effect May 1.

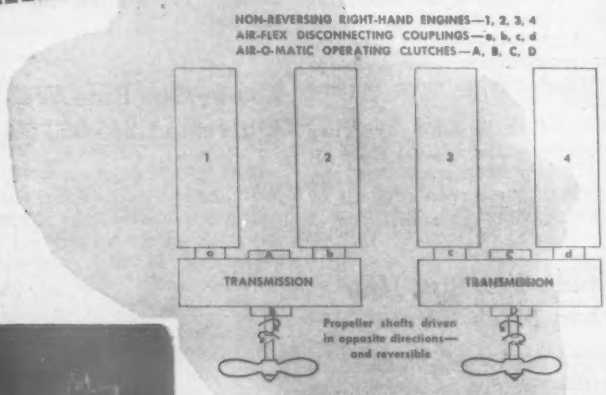
The Texas Public Service Co.'s new schedule begins at $1 for the first 400 cu. ft. The meter charge is eliminated.

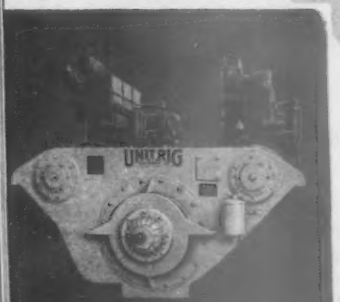
Action on Waste of Gas in Cement Field Promised

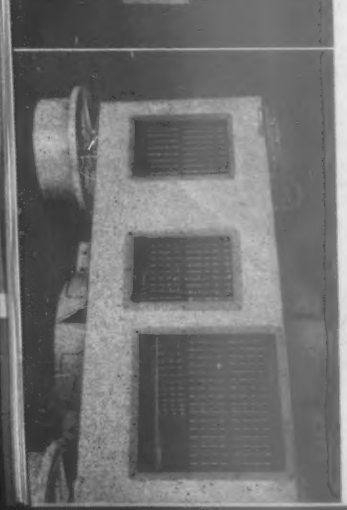
OKLAHOMA CITY.—Early action on waste of natural gas in the Cement field, Caddo County, was promised following a hearing held by the state Corporation Commission last week to receive suggestions for remedial regulations. A bench order was issued requiring Ohio Oil Co. to lower to 300 bbl. a day the flow from its 3 Kla-Ding, and to tube the well and thus halt gas waste, estimated by some at 9,000,000 cu. ft. a day. The commission then reset the hearing until April 27.

C. V. Millikan, engineer for Amerada Petroleum Corp., said that the gas waste should be cut at once as wells were draining the Walker lease, where Amerada was testing one well and starting another. It was suggested that all wells be cut back and the gas saved by tubing.

CARGO CARRIERS
Ship Propulsion Problem—







Solved with Roller Chain Drive Transmissions

● When Higgins Industries, Inc. took on the big job of building a fleet of twin-screw, 170-foot Cargo Carriers for the Army—in a hurry—it was necessary to develop special transmissions—also in a hurry—with which to drive each of the twin-screws, right-hand and left-hand, from two right-hand, high-speed, non-reversing engines—four engines per ship—with full-power, quick reversal—and with ample space between engines for servicing.

Compact roller-chain transmissions to meet these unusual requirements were developed promptly—approved by American Bureau of Shipping—and were ready for installation when the hulls were completed. Engineers of Unit Rig and Equipment Company, Tulsa; and Diamond Chain and Manufacturing Company, Indianapolis; collaborated on this job—Unit Rig with a background of wide experience in designing and building modern, high-speed, oil field drilling rigs, transmissions, and servicing units—and Diamond with more than half a century of experience in applying drives to all types of machinery and mechanisms.

The quiet and compact roller chain drives of these transmissions provide lasting high efficiency, outstanding durability, and great reserve strength. Loads being divided among many teeth, and being sustained at the roots of the teeth—not at tooth ends—these flexible drives are capable of continuing in operation in spite of possible damage as a consequence of exigencies of service which might completely disable other types of transmissions for which maintained perfection and rigidity of installation are essential.

Recommendations for *your* drive requirements are yours for the asking. DIAMOND CHAIN AND MANUFACTURING COMPANY, 475 Kentucky Avenue, Indianapolis 7, Indiana. Tulsa Office: 2238 Terwilliger Blvd.

DIAMOND **ROLLER CHAINS**

Exploration and Drilling

Week's Highlights

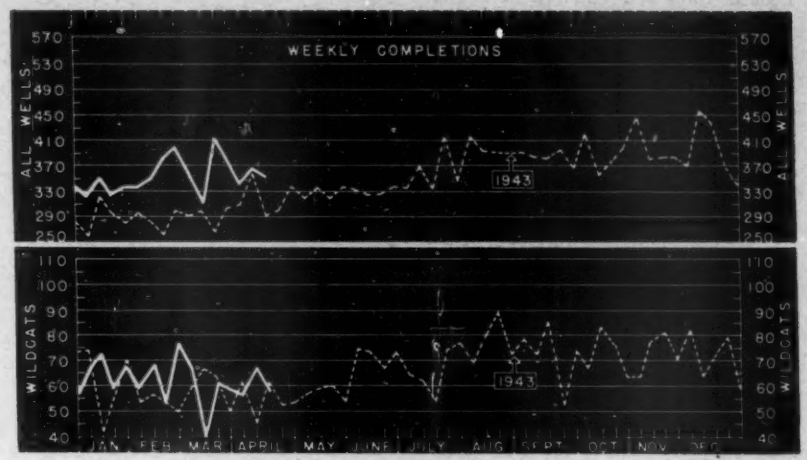
MISSISSIPPI has been drawing increasing attention from oil men for months, and developments have not disappointed them. The recent completion of Gulf Refining Co. 1 Lewis-Morrison unit in 30-1n-13e, offset to the discovery well in the Heidelburg pool, has been rated as the best well to date in that state, estimates ranging from 5,000 bbl. at the highest to 1,000 bbl. on an 11/32-in. choke as lowest.

Production is from a sand in the Tuscaloosa, probably the equivalent of the Eagleford-Woodbine in Texas. Reports indicate that about 160 ft. of oil saturation was found in the section between 4,518 and 4,948 ft., and production is coming from perforations at various levels.

One of the things that has attracted oil men to Mississippi is the wide variety of potential producing sands. Production or good oil shows have been found from the Wilcox of Eocene, the Selma, Eutaw, both upper and lower Tuscaloosa of the Upper Cretaceous, and the Paluxy in Lower Cretaceous.

It is interesting to note that oil and gas have been found in six fields in Mississippi and one in Alabama around and along the same trend as three major geological structural features. The major structural features are the Sharkey County uplift; the Jackson uplift and the Hatchitigbee anticline. The fields are the Carey in Sharkey County, the Tinsley and Pickens in Yazoo County, the Jackson gas field in Hinds County, the Heidelburg in Jasper County, the Eucutta in Wayne County, and the H. L. Hunt production in Choctaw County, Alabama.

Undoubtedly Mississippi will have its own distinctive characteristics as an oil-producing state, but there is nothing that the exploration and development branches of the oil industry like better than to find a new petroliferous region in which familiar sands produce oil and produce them from familiar types of local structures along major geological structural developments. The local peculiarities will be found, analyzed and understood as development proceeds. The important thing is that the major requirements for finding oil fields in the new area are just the same old problems that have been solved over and over again in other areas.



Solid line charts current weekly completions

COMPLETIONS IN ALL FIELDS . . .

(Week ended April 15, 1944)

	Oil	Gas	Dry	Total	Footage	Total Comp. to date 1944	1943
N. Y., Penna., W. Va.	43	13	5	61	105,584	948	884
Ohio	3	10	4	17	36,242	265	205
Indiana	2	0	2	4	9,319	67	75
Kentucky	5	3	3	11	24,616	155	89
Illinois	19	0	7	26	72,322	454	513
Michigan	1	0	10	11	25,740	151	121
Kansas	14	0	15	29	101,149	492	390
Nebraska	0	0	0	0	0	8	7
Missouri-Iowa	0	0	0	0	0	4	4
Oklahoma	23	2	10	35	128,386	422	321
Texas:							
North Central Texas	9	0	11	20	54,070	380	339
West Texas	23	0	7	30	148,830	411	246
Texas Panhandle	2	0	0	2	6,555	37	52
Eastern Texas	0	0	0	0	0	90	70
Texas Gulf Coast	11	3	8	22	147,163	202	107
Southwest Texas	1	1	4	6	18,748	229	244
Total Texas	46	4	30	80	375,366	1,349	1,058
Louisiana:							
North Louisiana	5	0	3	8	44,554	77	80
Louisiana Gulf Coast	5	0	6	11	102,328	117	92
Total Louisiana	10	0	9	19	146,882	194	172
Arkansas	0	0	1	1	4,507	61	67
Mississippi and Southeast	1	0	3	4	27,153	43	23
Montana	4	0	2	6	16,817	62	46
Wyoming	4	0	0	4	24,749	41	34
Colorado-Utah	0	0	0	0	0	10	5
New Mexico	4	0	1	5	13,063	112	63
California	28	0	12	41	153,094	525	321
Total United States	208	32	114	354	1,264,999	5,363	4,398
Total previous week	213	32	96	341			
Week ended April 15, 1943	175	35	80	290			

SOUTHWEST TEXAS

Developments Along Wilcox Trend Retaining Interest

CORPUS CHRISTI.—Developments along the Wilcox trend continued to hold interest in Southwest Texas. One new gas-distillate field was opened in De Witt County. Three other wildcats in De Witt, Goliad and McMullen counties had logged favorable showings and preliminary tests were being made.

About 3 miles northwest of Meyerville, De Witt County, Arkansas Fuel 1 William Buehrig, J. F. Kemper Survey, perforated casing at 7,627-35 ft., and on a 2½-hour drill-stem test through ¼-in. chokes top and bottom, the well flowed at the rate of 4 bbl. of distillate per hour and 3,500,000 cu. ft. of gas daily. Working pressure built up to 400 lb. Tubing had been run and the well was testing. Total depth is 9,017 ft.

Five miles soutneast of Yorktown, De Witt County, Butcher-Arthur, Inc., 1 Kilodzieyczyk was bottomed at 7,449 ft. and the hole was being reamed preparatory to a drill-stem test. The well cored from 7,408-7,412 ft., recovering 3 ft. of shale and 1 ft. of sand with an oil odor. At 7,417-41 ft. shale and sand with an oil odor were logged. At 7,441-46 ft. sand with an oil odor was recovered. Location is in the Jose Cantos Survey.

In Goliad County, Continental 1 S. H. Reed, 4½ miles south of the Slick Wilcox field, Continental Oil Co. was slated to test 1 S. H. Reed. Sandy shale and sand with a distillate odor were logged from 8,715-35 ft., and the well was drilled to 9,019 ft., before cementing 6-in. casing on bottom. The same company's 1 Heard, 10 miles northwest of Goliad County, which was testing the previous week, flowed 85 bbl. of fluid per day, of which 70 per cent was distillate and the rest b.s. and w, through a ¼-in. choke. The gas volume was 4,500,000 cu. ft. Production is at 8,490-95 ft.

Downdip from the foregoing development, in McMullen County, Atlantic Refining Co. apparently has opened distillate production from the Wilcox in 1 Atkinson, Martha J. Dean Survey 13. Sand having a gas-distillate odor was logged at 6,846-51 ft., and on a 20-minute drill-stem test at 6,851-61 ft., through ¼-in. chokes top and bottom, 9.76 bbl. of water-white distillate was recovered. Working pressure tested 1½ lb.

Five miles east of the Sweden field, Duval County, M. E. Davis 1 A. Parr, A. Garcia grant, is coring in shale below 5,493 ft., following a 10-minute drill-stem test at 4,933-39 ft., which showed 650-lb. working pressure and recovered 50 ft. of salt water with a slight trace of distillate.

SOUTHWEST TEXAS WILDCAT COMPLETIONS

Duval County: J. W. Gorman and Bridwell Oil Co. 1 W. K. Hoffman, dry at 3,376 ft.

Stanolind 4 Driscoll, S. Gray Sur., dry at 3,868 ft.

Jim Wells County: R. Cox and L. M. Josey 1 R. B. Jackson, J. Pachico Sur., dry at 6,383 ft.

Live Oak County: F. P. Galt 1 Brookshire, HT&B Sur., dry 3,660 ft.

E. M. Jones 104 Ezzell, Sec. 38, 44 bbl., pumping, TD 1,790 ft.

Victoria County: Rowan & Hope 1 Wagner 1, dry 4,505 ft.

TEXAS GULF COAST

East Flank of Fannett Field In Line for Deeper Drilling

HOUSTON.—The east flank of the Fannett field, Jefferson County, was in line for deeper drilling with the showing of Gulf 1-A Graigen, which is being prepared for a production test after an electrical survey showed possible recovery in several sand sections at intervals from 6,560 to 6,915 ft. Total depth is 7,204 ft., and casing was being cemented. This well is in the W. H. Smith Survey, about 2,800 ft. from the nearest production.

Development on this salt-dome structure during the past several years has been largely confined to the north and northeast flanks. It followed the opening of Frio sand production at intervals from 7,400 to 8,200 ft.

About 4 miles southeast of Fannett Sun 1 Wingate, the discovery well of a new field, is shut in for storage after flowing at the rate of 32 bbl. of 31.9-gravity oil in 20 hours through 12/64-in. choke. The discovery is in the D. Burrell Survey and is producing from the Frio sand at 8,655-77 ft.

American Republics 1 Sternenberg, discovery well of a new field 10 miles northeast of Kountz, Hardin County, is having trouble in eliminating salt water. Casing was reperforated at 6,230-32 ft., and the well flowed 57 bbl. of salt water and 37 bbl. of oil in 21 hour through a ½-in. choke. Tubing pressure was 150 lb.

Northern Ordnance 1 Ammann, 1¼ miles north of the Nada field, Colorado County, is slated to be tested the first of the week. Total depth is 6,800 ft., with 5½-in. casing cemented at 6,798 ft. This is the second well to be drilled in the area.

Ohio-Continental 1 Heffelfinger, 1½ miles south of El Maton, Matagorda County, which gave promise of opening a new field 2 weeks ago, continues to drill below 9,360 ft. with no important change.

TEXAS GULF COAST WILDCAT COMPLETIONS

Chambers County: J. W. Garth 1 Tyrell et al, F. Martin Sur., dry 9,228 ft.

Jefferson County: Glenn H. McCarthy 1 Lohmann, dry at 9,696 ft.

San Jacinto County: Navarro Oil Co. 2 Roberts, U. Gibson Sur., dry at 8,509 ft.

LOUISIANA GULF

New Producing Field Added By Krotz Spring Prospect

NEW ORLEANS. — The Krotz Springs prospect, eastern St. Landry Parish, was being added to the list of producing fields in the Louisiana Gulf Coast this week, following recovery of pipe-line oil in The Texas Co. 1 H. Swift. The well is drilling ahead in shale below 10,814 ft. A drill-stem test in open hole at 10,612-48 ft., recoverd 26 stands of oil. This well has been looked upon as a possible pool opener since it blew out at 10,617 ft., and the hole had to be sidetracked. The structure is about 10 miles southeast of the Port Barre field, and approximately 2 miles west of the Atchafalaya River.

In the same parish, and located in the northeast Cankton area in 48-8s-4e, Sun Oil Co., was slated to test 1 E. M. Boagni after plugging back to 9,720 ft. from a total depth of 10,514 ft. An electrical survey showed several sands with probable production from 9,674 to 9,686 ft.

In the Church Point area, Acadia Parish, Union Sulphur Co., Inc., 1 E. E. Daigle is bottomed at 9,696 ft. with 7-in. casing cemented at 9,686 ft.

Continental-Standard Oil Co. of Kansas 1 Standard Oil Co. of Kansas, north of the St. Martinsville field, St. Martin Parish, is below 9,950 ft. and is scheduled to run an electrical survey at 10,000 ft. The well is reported to have shown gas pressure at 9,875 ft.

Possible production from a new deep sand on the northeast flank of the Section 28 Dome, St. Martin Parish, was indicated by Gulf 1 Iowa-St. Martin Land Co. in 21-9s-7e. Total depth is 11,300 ft. with 5½-in. casing cemented at 11,249 ft., and the well is expected to be tested at intervals at 11,066-11,169 ft.

In the Reddell field, Evangeline Parish, Continental prepared to test 1 Dr. William A. Quirk.

Continental Oil Co. 4 Sturdivant, on the south side of the South Roanoke field, Jefferson Davis Parish, an old well which was deepened from 9,979 ft., has reached a depth of 11,585 ft., and preparations are being made to test a new deep sand at 11,345-58 ft. South Roanoke was originally opened as a gas-distillate field and record-

DAILY AVERAGE PRODUCTION FOR WEEK

	Apr. 15 crude oil	Distillate, allied products	April PAW quota all oils	Apr. 8 crude oil
Arkansas	79,550	5,000	81,700	79,200
California	829,450	47,000	876,400	825,250
Colorado	7,950	.....	7,000	8,060
Eastern	78,600	8,600	81,000	76,600
Illinois	214,900	13,000	228,000	224,100
Indiana	15,000	.....	13,600	13,900
Kansas	272,300	5,800	290,800	257,300
Kentucky	20,300	2,700	25,700	21,700
Louisiana	358,500	34,000	381,700	358,500
North Louisiana	76,100	.....	.....	76,000
Louisiana Gulf	282,400	.....	.....	282,500
Michigan	52,560	300	53,300	48,850
Mississippi	40,800	.....	45,000	41,400
Montana	23,050	300	24,300	21,690
Nebraska	1,200	.....	1,000	930
New Mexico	112,650	4,900	116,600	112,550
Oklahoma	331,900	28,000	356,000	330,800
Texas	1,910,250	127,000	2,043,000	1,910,350
East Texas	362,500	.....	.....	362,300
West Texas	373,900	.....	.....	374,000
North Central Texas	143,800	.....	.....	143,850
East Central Texas	127,250	.....	.....	127,250
Texas Panhandle	91,100	.....	.....	91,100
Texas Gulf	716,700	.....	.....	716,800
Southwest Texas	95,000	.....	.....	95,050
Wyoming	88,660	6,900	99,900	87,330
Total United States	4,437,620	283,500	4,725,000	4,418,510

Total production January 1-April 15, 1944 ..... 497,098,731 bbl.
Same period last year ..... 408,192,630 bbl.

LIFE LINE *to an* OIL WELL

THE line that runs-off the drum of a sturdy A-C Winch Tractor has certainly been the life-line to thousands of wells producing oil for our war effort.

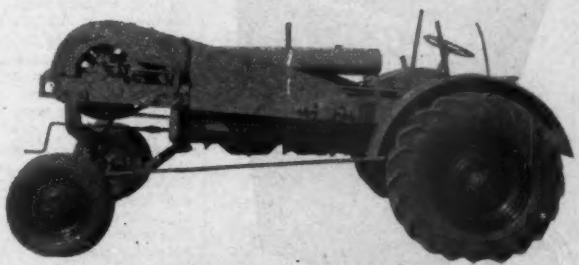
Without the services of the mobile Allis-Chalmers Pulling and Cleaning-out Units many wells could not have been maintained in producing condition, because a majority of the pumping well fields *depend* on this equipment for their well servicing.

During this period when Allis-Chalmers Units are being worked overtime and subjected to the roughest kind of treatment, to get wells serviced in a hurry, the percent of units down for service or repairs is no greater than in *normal* times.

Our supply of genuine Allis-Chalmers parts is good—so don't let your pulling equipment stand idle. Keep those Life Lines running.

ALLIS-CHALMERS MODEL M

Single or Double Drum Winch Tractor. Road speeds 15 or 30 m. p. h. maximum. Eight line speeds on the winch drum to 900′ p. m. at 1,200 engine r. p. m. Maximum line pull 32,600 ft. lbs.



ALLIS-CHALMERS MODEL W

Single Drum Winch Tractor. Road speed 15 m. p. h. maximum. Winch drum has eight line speeds available to 539′ p. m. at 1,200 engine r. p. m. Maximum line pull 20,666 ft. lbs.

FRED E. Cooper

SURE CURE
FOR PIPE CORROSION HEADACHES

Your pipe protection worries disappear when you turn over the job to Pipe Line Service Corporation. No matter what or where your problem may be, you can count on America's most complete pipe coating and wrapping service for the practical answer.

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ed its first oil production about 2 weeks ago with the completion of an excellent producer on the northeast flank.

PERMIAN BASIN

Coke County Well Promises Ellenburger Production

MIDLAND.—In the Blackwell pool of northwestern Coke County, Warren Petroleum Co. 1 Fowler, east offset to the Strawn discovery well brought in last year, offers strong possibilities of producing from the Ellenburger, which it topped at 6,393 ft. A core at 6,415-20 ft. showed fractures bleeding in spots, and casing was being run to make a test for production. An electrical survey showed saturation from 6,390 to 6,416 ft. before decision to run casing was made. This well is miles from any Ellenburger production, and if successful will open a vast area for exploration to this horizon.

Reagan County.—Largest well yet completed in the Barnhart pool is Amerada Petroleum Corp. 2-A Hickman, in the W. B. Henderson Survey at the northwest edge of the pool. It was completed last week for an initial potential of 8,143 bbl. per day through perforations at 9,008-9,200 ft. Total depth is 9,235 ft., plugged back to 9,205 ft. The test is ½ mile north of the previous largest well, which made 4,898 bbl. per day, indicating that the flush part of the huge Ellenburger structure lies northwest of that part of the pool thus far developed.

Crane County.—A new producing spot for Crane County has apparently been opened at Schermerhorn Oil Co. 1 McKnight, SW SW Section 7, Public School Land, east of the McKnight pool and northwest of the Sand Hills pool. This wildcat was flowing and swabbing at the rate of 5 bbl. per hour through perforations at 4,635-4,720 ft. The Silurian was topped in The Texas Co. 1 Hobbs, in the southeastern part of the county at 5,685 ft., surface elevation 2,374 ft. This well has been drilling deeper after assuring production from the Devonian. Dennis & Fitzgerald 1 McPherson was drilling into the Simpson formation after taking a core showing green shale at 5,119-39 ft. Crane County has four wildcats drilling and a fourth about to start.

Andrews County.—A half-mile northeast extension for the Union pool has been effected by Shell Oil Co., Inc., Scarborough estate, which flowed 889 bbl. of oil and 88 bbl. of water at 7,280-7,480 ft. It was plugged back from total depth of 7,726 ft. to shut off water. A new 10,500-ft project for the county is Sun Oil Co. 1 N. H. Martin, SE NE Section 17, Public School Land. 6½ miles northwest of Ellenburger production in the Embar pool. It is about 15 miles southwest of Andrews.

Gaines County.—Continental Oil Co. 1-A Jones, deepest test ever drilled in the north basin, was bottomed at 12,222 ft., and ran electric logger and caliper survey before running liner to test. Top of the Ellenburger was determined at 11,845 ft.

Pecos County.—Shell's 1 Atlantic Refining Co., east offset to the discovery well in the Owega Ellenburger pool, topped the Ellenburger at 4,005 ft., and drill-stem test at 3,995-4,040 ft. showed only drilling mud. The discovery well, Bryce McCandless 1 Atlantic Refining, which encountered Ellenburger production at the shallowest depth in the Permian Basin, is reported to have turned to wafer and has been shut in to await the outcome of the two offsets. Humble Oil & Refining Co. has staked two new wildcats in the county. Its No. 1 O. W. Williams is 11 miles northwest of Fort Stockton, and its No. 1 State National Bank of El Paso is 6 miles southeast of the Heiner pool. Another wildcat for the district is Stanolind Oil & Gas Co. 1-H Midland Farms, 8 miles south of Mabee pool.

Kimble County.—Phillips Petroleum Co. 1 Spiller, near the Menard County line, was reported to have shown oil in drill-stem test after a show of over 2,000,000 cu. ft of gas was reported at 2,400-05 ft.

WEST TEXAS WILDCAT COMPLETIONS

Crane County: Rio Bravo 1 fee, Sec. 31, Blk. 1, H&TC Sur., dry at 2,261 ft.

Dickens County: Humble 1-F Matador Land & Cattle Co., Sec. 10, Blk. AS, J. S. Calloway Sur., dry at 6,967 ft.

Seaboard 1 Pitchfork Land & Cattle Co., Sec. 93, Indianola Ry. Sur., dry at 5,161 ft.

Hockley County: Texas Pacific C. & O. 1 J. E. and Hardy Grissom, Sec. 10, McCulloch County School Land, dry at 5,283 ft.

Pecos County: Phillips 1 Iowa Realty Trust, Sec. 139, Blk. 10, H&GN Sur., dry at 4,178 ft.

Yoakum County: Helmerich & Payne 1 Higginbotham Bros., Sec. 539, Blk. D J. H. Gibson Sur., dry at 5,425 ft.

SOUTHEAST NEW MEXICO

HOBBS.—Second well for the Caprock pool, 10 miles south of Caprock in northwestern Lea County, has been completed. It is Malco Refineries, Inc., 1 State, 31-12s-32e, southwest offset to Great Western Development discovery of several years back. The new well is pumping 5 bbl. per hour from lime pay at 3,027-31 ft., total depth.

A revival of drilling in the Arrowhead pool seems likely with completion of Humble Oil & Refining Co. 6-M State, on the southeast edge of the pool in 19-22s-37e. Topping the pay at 3,635 ft., this well flowed 66 bbl. per hour to establish a daily potential of 1,584 bbl. Total depth is 3,717 ft. A south offset has been started.

In Eddy County, northwest of the Square Lake pool, Humble has started a semiwildcat at 1 Federal-Carpenter, 20-16s-30e.

SOUTHEAST NEW MEXICO WILDCAT COMPLETIONS

Lea County: Magnolia Pet. 1-U State, 10-11s-35e, dry at 5,505 ft.

MICHIGAN

Tests Yield Succession of Failures, One Producer

SAGINAW. — A succession of dry holes marked test completions of Michigan oil fields last week, the only producer being a Van Buren County well in Geneva Township, which pumped 40 bbl. a day after acid treatment. Ten other tests, including two wildcats, one a deep exploration in Sherman Township of Gladwin County, were failures.

Sun Oil Co. went to 4,865 ft. in its Sherman Township, which failed to develop more than a slight oil show. Also among the dry holes was one in Dalton Township, Muskegon County. A wildcat produced oil in that township a few months ago and was followed late last month by a second, smaller well.

The state Conservation Department issued 11 new drilling permits. Muskegon County got three; Allegan and Missaukee two; Lake, Newaygo, Van Buren and Gratiot each one, bringing the total for the year to 141.

MICHIGAN WILDCAT COMPLETIONS

Gladwin County, Sherman Township: Sun Oil Co. 1 Ervin D. Nash, C NE SW SW 31-20n-2w, dry at 4,865 ft.

Van Buren County, Bangor Township: Harris Oil Co. 1 Barbieri, NE NE SW 24-2s-16w, dry in Traverse limestone at 1,054 ft.

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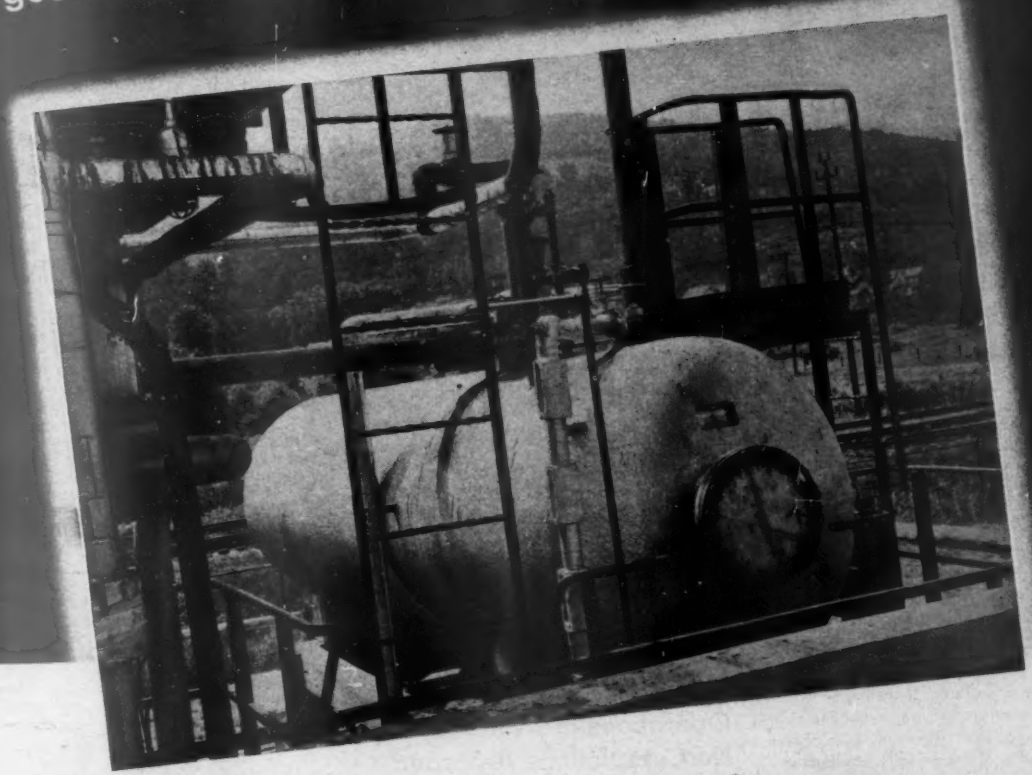

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CALIFORNIA

Outcome of Test in Northeast Coalinga Is Still in Doubt

LOS ANGELES. — Whether flowing production can be developed in The Texas Co. 58-21 Southern Pacific, in the Northeast Coalinga field, Fresno County, remains to be seen. The operator cored top of the Gatchell oil sand at 9,490 ft., but only the upper 25 ft. looked promising. The test, in 21-19s-16e, is about a mile east of present production. The 7-in. casing was landed at 9,490 ft. The well was carried to 9,555 ft. and drilling was concluded in a hard gray sand preparatory to making a production test. Completion would lead to additional drilling toward the west and then in other directions if developments should warrant.

In the Polvadero district, about 10 miles southeast of the Northeast Coalinga test, Standard Oil Co. of California is conducting a series of tests on 1-A Bourdieu, which has found interesting showings This wildcat is between the Coalinga Nose field and Kettleman North Dome.

In the Cymric district, north of the McKittrick field, Superior Oil Co. has finished a small pumping well in 23-29s-21e but it is not certain that the oil sand will yield commercial production.

Drilling operations in California during the current year to date are running substantially ahead of last year when 1,447 wells were drilled. From present indications 1,750 new wells will be completed before the end of 1944. About 1,400 of them should prove commercially productive oil or gas wells.

CALIFORNIA WILDCAT COMPLETIONS

South Mountain wildcat district, Ventura County: Wilshire Oil Co. 1 Petit, 9-3n-20w, abandoned at 1,804 ft.

Tejon wildcat district, Kern County: Tejon Oil Co., 19-11n-19w, abandoned because of mechanical trouble at 9,393 ft.

EASTERN TEXAS

Operations at New Low and No Completions Recorded

DALLAS.—Operations in the East Texas district have dropped to a new low, with no completions recorded for the past week. Two new Paluxy wildcats were staked, both in the north part of the district. In eastern Hunt County, 1½ miles west of the Hopkins County line, Humble Oil & Refining Co. 1 C. H. Denton is located 5 miles northwest of the Lone Oak Community. In Wood County, 1 mile southeast of Quitman, Allied Oil Co. has staked 1 Reba Chreitzberg to go 7,000 ft. in search of Paluxy sand production.

Limestone County.—Zephyr Oil 1 Nusselbaum & Scharff, S. H. Bates Survey, 3 miles west of Groesbeck, deep test on the fault, was indicating possibilities of producing from the Rodessa at 4,734-88 ft. This well was acidized, made a little oil with gas and water, and died, but has been flowing oil by heads, making about 50 bbl. per day. The Rodessa was topped at 4,742 ft., with the Pettit at 5,415 ft. Total depth is 5,515 ft. in lime.

Wood County.—Shell Oil Co., Inc., 1 Herring-Scoggins unit, Samuel Burch Survey, Manziel pool, is to be carried to 9,400 ft. in search of Travis Peak production.

Panola County.—Two miles southwest of gas-distillate production in the Carthage pool, W. C. Feazel and Norman Kinsey 1 Ross, in the Moorman Survey, afforded an extension when it flowed an estimated 8,000,000 cu. ft. of gas from 6,475 ft., the total depth, in Travis Peak lime. Casing has been cemented on bottom, and perforations will be made opposite the Pettit, which indicated porosity on electric log.

APPALACHIAN FIELDS

Maryland Deep Test To Be Abandoned

PITTSBURGH.—The important wildcat of National Supply Co. on their fee at Ambridge in Harmony Township, Beaver County, Pennsylvania, topped the Oriskany sand at 5,471 ft., and shut down at 5,484 ft., with 1,500 ft. of salt water intruding in 11 hours. The Onondaga lime was topped at 5,315 ft. (corrected measurement), making that section 156 ft. thick.

In Westmoreland County on the west flank of the Grapeville anticline in Hempfield Township about 4 miles west of Greensburg, Peoples Natural Gas Co. completed a fair gas well in the Murraysville sand on the Cora Sell farm. The open flow was 700,000 cu. ft. from a total depth of 1,430 ft.

The deep test of William E. Snee et al scheduled for the Oriskany sand on the DeLeon T. Rush farm on the Accident dome in Garrett County (Maryland) reached 6,539 ft., and in the brown shale without striking the Burkett shale definitely placing it low on structure. It will be abandoned.

In Harrison County, West Virginia, Park Gas Co. completed a test on the Norwood Park land in the Fourth sand at 2,214 ft., and it is showing for 3 bbl. a day. There is no oil production within 6 or 8 miles of this well but several Fifth sand gas wells to the north, east and west with some untested acreage to the south. It is probably a local lens.

In Tucker County the rotary test of Ohio Oil Co. on the Kaemmerling tract in Dry Fork district, recovered the dropped drill pipe and resumed drilling reaching 7,970 ft., or within 5 or 6 ft. of the Oriskany sand as found in the cable-tool attempt. It is drilling in hard chert and making about 2 ft. per bit.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, General Land Office, Washington, D. C. Notice is hereby given that the N½ NW¼ Sec. 14, T. 26 N., R. 90 W., 6th P.M., 80 acres, Lost Soldier oil and gas field, Wyoming, is offered to the responsible qualified bidder of the highest cash bonus per acre for lease under section 17 of the mineral leasing act, as amended by the act of August 21, 1935 (49 Stat. 674, 30 U. S. C. 226). The minimum acceptable bonus is $2,000 per acre. Sealed bids will be received in the office of the Secretary of the Interior, Interior Building, Washington 25, D. C., up to 12 noon May 1, 1944. Each bidder must submit a certified check or cash for one-fifth of the amount bid, payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease required by section 7 of Circular 1386. The remainder of the bonus and the annual rental at the rate of $1 per acre must be paid and a $5,000 corporate surety bond must be furnished by the successful bidder prior to the issuance of the lease. The deposits of the other bidders will be returned. The envelopes should be plainly marked "Bid for lease in Lost Soldier field. Not to be opened before noon May 1, 1944." No bid received after the time fixed herein for submitting bids will be considered. Bidders are warned against violation of section 50 U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids in the discretion of the Secretary of the Interior. Fred W. Johnson, Commissioner.

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ILLINOIS

Pure Extends Clay City Field With 1,200-bbl. Well

CENTRALIA.—Flood water from the Wabash River and tributaries put a stop to numerous drilling operations and prevented the production from some completed wells in southeastern Illinois during the week.

The only large initial producer was Pure Oil Co. 1 M. E. McDowell, C SW NW 23-1n-8e, a "near" wildcat, which extends the Clay City field in Wayne County. It had McClosky lime at 3,049-59 ft., total depth 3,073 ft., and after it was acidized with 5,000 gal. it pumped 738 bbl., 727 bbl., 684 bbl. on successive days and then on its completion test pumped and flowed 1,223 bbl. in 24 hours.

Nineteen oil wells were completed during the week, but 18 of these averaged only 65 bbl. per well in initial output.

Twenty-seven new operations were reported, including five wildcats in as many counties: D. S. Ring 1 Leroy Clayton, SE SE NE 2-5s-3e, Franklin County; Big Chief Drilling Co. 1 Charles Ross, C NW NW 35-7n-9e, Jasper County; P. D. Lynch 1 H. Amiling, NE NE NW 20-12n-2e, Shelby County; George Cassen 1 Marberger, NW SE SE 31-8n-5w, Montgomery County, and Magnolia Petroleum Co. 1 Reucher-Froembling, NW SE SW 11-7s-4w, Jackson County.

The Albion pool in Edwards County was extended by Superior Oil Co. 1 J. Lambert, C S½ NW SE 31-1s-11e, which, after an acid treatment in McClosky lime at 3,101-04 ft. and 3,138-41 ft., flowed 882 bbl. through perforated casing. Another interesting test, not yet a completion, was Cascade Refining Co. and Sam Gilpin et al 1 D. M. Marlin trustee, in SW NW SW 26-6s-9e, which was swabbing at the rate of 140 bbl. per day from Aux Vases sand at 2,904-12 ft. This area has proved spotted, but this well may revive interest in it.

ILLINOIS WILDCAT COMPLETIONS

Clay County: C. W. Talbot 1 Smith-Arbuthnot, SW SW NE 16-3n-6e, dry at 3,130 ft., lower Kinkaid 2,026 ft., Barlow 2,582 ft., lower Renault 2,858 ft., Ste. Genevieve 2,933 ft., St. Louis 3,126 ft.

Jefferson County: B. M. Heath 1 Hurst, SE SE NW 19-1s-3e, dry at 2,628 ft., Menard 1,737 ft., Cypress 2,175 ft., Aux Vases 2,392 ft., McClosky 2,535-85 ft., at intervals.

Franklin County: Magnolia 1 Hall unit, NW NE NW 14-5s-3e, dry at 3,252 ft., Menard 2,212 ft., Cypress 2,730 ft., Aux Vases 2,980 ft., McClosky 3,102-44 ft.

CANADIAN FIELDS

Untested Turner Valley Sites Giving Small Producers

CHATHAM.—Drilling out of untested sites in the proven area of West Central Turner Valley under the sponsorship of the government-owned Wartime Oils, Ltd., is bringing in some comparatively small producers. Anglo-Canadian 10, LSD 4, 25-19-3w5, finished at 8,264 ft., had initial production of 196 bbl. of 39.3° crude, with 413,000 cu. ft. of gas. Okalta 14, 24-19-3w5, started with 54 bbl. daily of 41° crude with estimated 54,000 cu. ft. of gas. Royalite Oil Co. is also drilling out sites in the older sections of North Central and North Turner Valley. Royalite 49, LSD 14, 22-20-3w5, started with 223 bbl. of 40° crude and 660,000 cu. ft. of gas, and Royalite 73, in the same general area, has initial output of 77 bbl. of 45° crude with 1,553,000 cu. ft. of gas. Several new tests are being started.

Taber.—Activity in the Taber field, southern Alberta, has been encouraged by increased outlets for the 18-gravity crude. Agreements by Dominion Oil to market its output to the Imperial Oil refinery at East Calgary and the Pacific refinery at Lethbridge will permit stepping up of the company's six producers to a daily aggregate of around 1,000 bbl. as against 189 bbl. daily for March. Shipments of Taber crude to Imperial have already started. Mid-Continent 3, LSD 13, 1-8-17w4, to the south and west, looks like a possible producer at 3,348 ft. and new operations are under way in several other areas outlying the proven field. About a mile west, Universal Petroleums, of Alberta, sponsored by a Toronto group, is starting in LSD 15, 25-8-17w, and will drill three wells. Dominion-Conrad 1, LSD 8, 11-5-15w4, has started; Barnwell-Taber 1, LSD 5, 10-9-17w4, is resuming; Major 1, LSD 12, 9-9-17w4, and Mid-Continent 4, LSD 11, 1-8-17w4, are rigging. An outpost well considerably to the southeast is Lion-Taber 1, LSD 8, 22-7-15w4, down 2,771 ft.

South Turner Valley.—Major Consolidated Oils is arranging for a joint test by a group of Turner Valley companies on acreage of Davies Petroleum in 33-17-2w5, and W½ 34, south of the proven Turner Valley area. North limit of the acreage is about 6 miles south and somewhat east of the Northwest-Hudson's Bay producers in 8-18-2w5, which mark the approximate southern limit of Turner Valley production.

Wildcat Hills.—In the foothills west of Calgary, Imperial-Wildcat Hills 1 deep test, LSD 16, 30-27-5w5, is in Fernie shales below 11,062 ft. after getting the brown sand of the Dalhousie formation at 10,980 ft. Test is believed near the Madison limestone and getting close to the record depth for Canada of over 12,000 ft. established by the Shell-Norman test in the Jumping Pound area.

Lloydminster.—A 10-well drilling program

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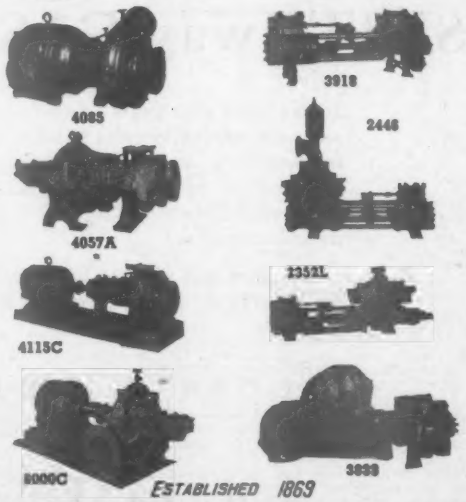

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for the Lloydminster field in eastern Alberta has been announced by R. L. Shaw and associates, following discovery of multiple oil sands in three wells. The sands have been proven from Shaw-Alberta 3, LSD 5, 35-49-1w4, 2 miles west of Lloydminster, to Sparky 1, LSD 8, 32-49-11w4, and Sparky 2, LSD 5, 33-49-1w4, approximately 2 miles farther west. Discovery of multiple sands followed deepening into the lower Cretaceous below the normal depth of around 1,905 ft., and the formations include the Sparky oil sand and the upper gas members and two lower oil members of the Colony sand, the latter being an important gas reservoir on the Saskatchewan side of the provincial boundary.

Hutton.—In the Hutton area of the Central Alberta plains, outlying the old Steveville field, Riley-Lloyd 1, LSD 16, 5-23-14w4, bottoming at 4,197 ft. with Devonian limestone contact at 4,181 ft., is making drill-stem test of a 7-ft. sand in the top of that formation. The test is sponsored jointly by A. H. Mayland, British-American Oil Co., Anglo-Canadian Oil Co. and General Petroleums, all of Calgary. Location is about 23 miles northwest of the original Steveville-Princess producer.

ROCKY MOUNTAIN

Discovery Opens Black-Oil Field in Big Horn Basin

DENVER.—Two discoveries, one a completion and the other drilling ahead to test lower horizons, are features of the week. The completion, which opens a new black-oil field in the Embar horizon on the southwestern rim of the Big Horn basin, is Broderick & Gordon 1 Christensen, NE SE 6-44n-98w, Hot Springs County, 4 miles northwest of the Hamilton field and 10 miles south of the Grass Creek. It penetrated approximately 60 ft. of saturated Embar on the way down and stopped for a drill-stem test at 4,261-4,306 ft., which showed 540 ft. of oil, 210 ft. of cut mud and 180 ft. of water-cut oil. It topped the Tensleep at 4,508 ft. and continued drilling to 4,709 ft. The Tensleep cores showed oil saturation, but on drill-stem test only water was recovered. The operator then plugged back to the 7-in. at 4,361 ft. and perforated opposite the Embar at 4,278-4,302 ft. After acidizing it swabbed 497 bbl. of pipe-line oil in 24 hours, the crude testing 23.9 gravity.

The structure, located by T. S. Harrison, Denver geologist, is an unfaulted anticline with 400 ft. of closure, plunging to the northwest, with Cody shale at the surface. Broderick & Gordon, Denver contractors, have a block of 2,877 acres, assembled by H. C. Bretschneider, of Denver, who retained a substantial working interest. One other test, ¼ mile to the west, drilled years ago by Midwest Refining Co., stopped in the Embar at 4,330 ft., where sulfur water was encountered after having a good oil show at 3,060-90 ft. Elevation of discovery well is 5,513 ft.

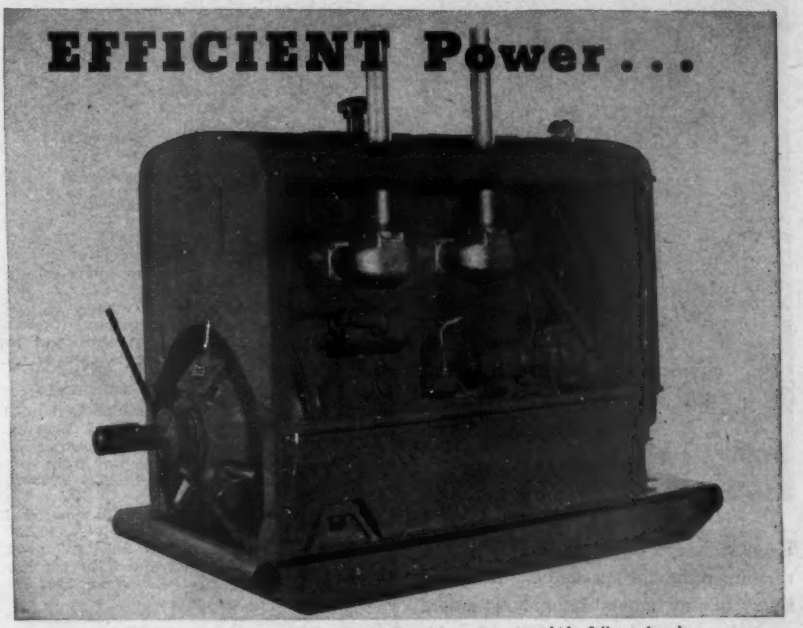
The other discovery, drilling ahead, is on the Cooper Cove structure, a narrow faulted dome on the south end of the Rock River anticline in Carbon County, in Stanolind Oil & Gas Co. 1 Johnson-Parkinson, SE NE SW 20-18n-77w. It had the Dakota sand at 4,834-4,911 ft., and in two drill-stem tests at 4,850-71 and 4,868-93 ft., each open 75 minutes, 3,500 ft. of 34.2-gravity oil and 120 ft. of mud-cut oil were recovered in each. Tests in the Muddy were unsatisfactory, but showed saturation. The well is drilling ahead at 4,965 ft. with the Sundance as the next objective. The elevation is 7,660 ft. Tops encountered included Frontier at 4,075 and Muddy at 4,725 ft. The dome previously had been tested by Utah Oil Refining Co. and Ohio Oil Co., but neither reached the Dakota.

Test for Little Dome.—Superior Oil Co. of California is moving in rotary to drill an Embar-Tensleep test on the Little Dome, on the Maverick Springs anticline, Fremont County, Wyoming, approximately 6 miles southeast of the Maverick Springs black-oil field. Location is in SW SE SE 10-5n-1w. The objective is expected at around 3,500 ft. The company has a block of 1,880 acres.

Dakota test at Kutz Canon.—A deep test stratigraphically is to be drilled in the center of the San Juan basin in northwestern New Mexico to explore the possibilities of the Dakota series in the Kutz Canon gas field by Transcal Realty & Development Corp., of Los Angeles, and the Kutz Canon Oil & Gas Co. A heavy-duty rotary rig is being built over Kutz Canon Oil & Gas Co. 1 Government, C NW NW 28-28n-10w, which has been shut down at 1,653 ft. for the past 4 years with the 12½-in. cemented at 1,448 ft. It will be deepened to the Dakota, estimated at 5,700 to 6,500 ft. It will be a test of more than ordinary interest as Kutz Canon is a basinward structure which has been producing gas from the Picture Cliff sandstone of Upper Cretaceous age at 1,900 ft. for the past 17 years, but never has been tested to the deeper horizons. The field is 50 miles east of the Rattlesnake pool, where the Dakota is found at around 700 ft. Eastward the formations dip rapidly and reach their greatest depth at about the area of the Kutz Canon field. Kutz Canon Oil & Gas Co. has a block of 11,400 acres. The first well will be drilled at the joint expense of the two companies after which the acreage will be divided.

Lakota sand pool in Big Muddy.—Continental Oil Co. appears to be developing a nice Lakota sand pool in the Big Muddy field east of Casper. Last December it completed 34 Crary, SE NW NW 9-33-76, at 4,344 ft., which flowed 16 bbl. per hour the first 8 hours. In Februrary of this year its 61 Whiteside, a north offset, pumped 24½ bbl. per hour on a 24-hour test. Its 35 Crary, a west offset, completed the past week,

(Continued on page 115)



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OHIO, KENTUCKY

Ohio Fuel Opens Gas Field in Medina County

ZANESVILLE, Ohio.—The fourth gas discovery in the Lorain-Medina area since the Wellington pool was found is indicated by a wildcat completion near the center of Litchfield Township, Medina County. The completion by the Ohio Fuel on the Yost tract in Lot 22 gaged 6,580,000 cu. ft. natural with a rock pressure of 1,280 lb. in the Clinton sand at 2,710-17 ft.

The Penfield pool in Lorain County was extended ½ mile to the northeast by a small well on the Gamberson tract in Lot 31 completed by the Pittsburgh Oil & Gas Co. Sand was found at 2,510-27 ft. and had a shut-in gage of 303,000 cu. ft. with a rock pressure of 1,130 lb.

Hanley & Bird completed their second well in the Lagrange pool, Lot 74, Serette tract. Sand at 2,384-89 ft. gaged 187,000 cu. ft. and at 2,397-99 ft. an additional 283,000-cu. ft. well was shot and estimated at 1,000,000 cu. ft. shut-in gage with a rock pressure of 1,270 lb.

OHIO WILDCAT COMPLETION

Medina County, Litchfield Township: Ohio Fuel 1 E. J. Yost, Lot 22, Clinton 2,710-17 ft., 6,580,000 cu. ft., TD 2,718 ft.

WESTERN KENTUCKY

OWENSBORO, Ky.—Miller-Shiarella and Ashland Refining Co. opened a productive area in Daviess County with 1 W. N. Vaughtin 20-J-31, 3 miles north of West Louisville. It had not been shot and its initial production was only 15 bbl. of oil.

WESTERN KENTUCKY WILDCATS

Daviess County: Miller-Shiarella-Ashland 1 C. R. Simmons, 20-O-27, 1 mi. E of W. Louisville and 4½ mi. from other oil wells, pumped 15 bbl. per day from Aux Vases sand at 1,835-67 ft., TD 2,023 ft. Opens pool.

Henderson County: National Associated 1 J. W. Pruitt, SE NW SE 4-N-24, 10 mi. S of Henderson, dry at 2,593 ft., lower Menard 1,671 ft., Barlow 2,124 ft., Renault 2,311 ft., Ste. Genevieve 2,434 ft., McClosky lime 2,526-42 ft.

EASTERN KENTUCKY

ASHLAND.—Two oil wells were completed in eastern Kentucky in the past week with reports showing a number of new lo-

(Continued on page 115)

Geological Developments In Southeastern States

(Continued from page 41)

production came from the Tinsley and Pickens fields. Drilling during the year developed new productive horizons in the Wilcox and Basal Tuscaloosa. In addition to these, showings of oil were reported in the Paluxy and Glen Rose of Lower Cretaceous.

Alabama

During 1943, 10 wildcat operations were completed in Alabama. These tests drilled an average total depth of 4,206.3 ft. During 1942, nine wildcats drilled an average total depth of 2,990 ft Drilling in 1943 was equally divided between five tests drilled in the Warrior Coal Basin in the northern part of the state and five operations in the southwestern area. The deepest test for the period was drilled in Choctaw County. It was dry at a total depth of 5,942 ft. in the Tuscaloosa.

There were no spectacular developments, although drilling has added to general geological information. The Massive sand of the Basal Tuscaloosa is present and offers a reasonable chance for production. The Eutaw is present also, but drilling indicates that it may be represented by a shale-chalk section rather than sand. Until more drilling has been done, there is no way to predict how widespread this condition may be. The Paluxy is present and may be represented by a sand section, although more information is needed concerning its character. One deep well in Alabama indicates that the Cotton Valley and Smackover limestone of the Jurassic will be represented.

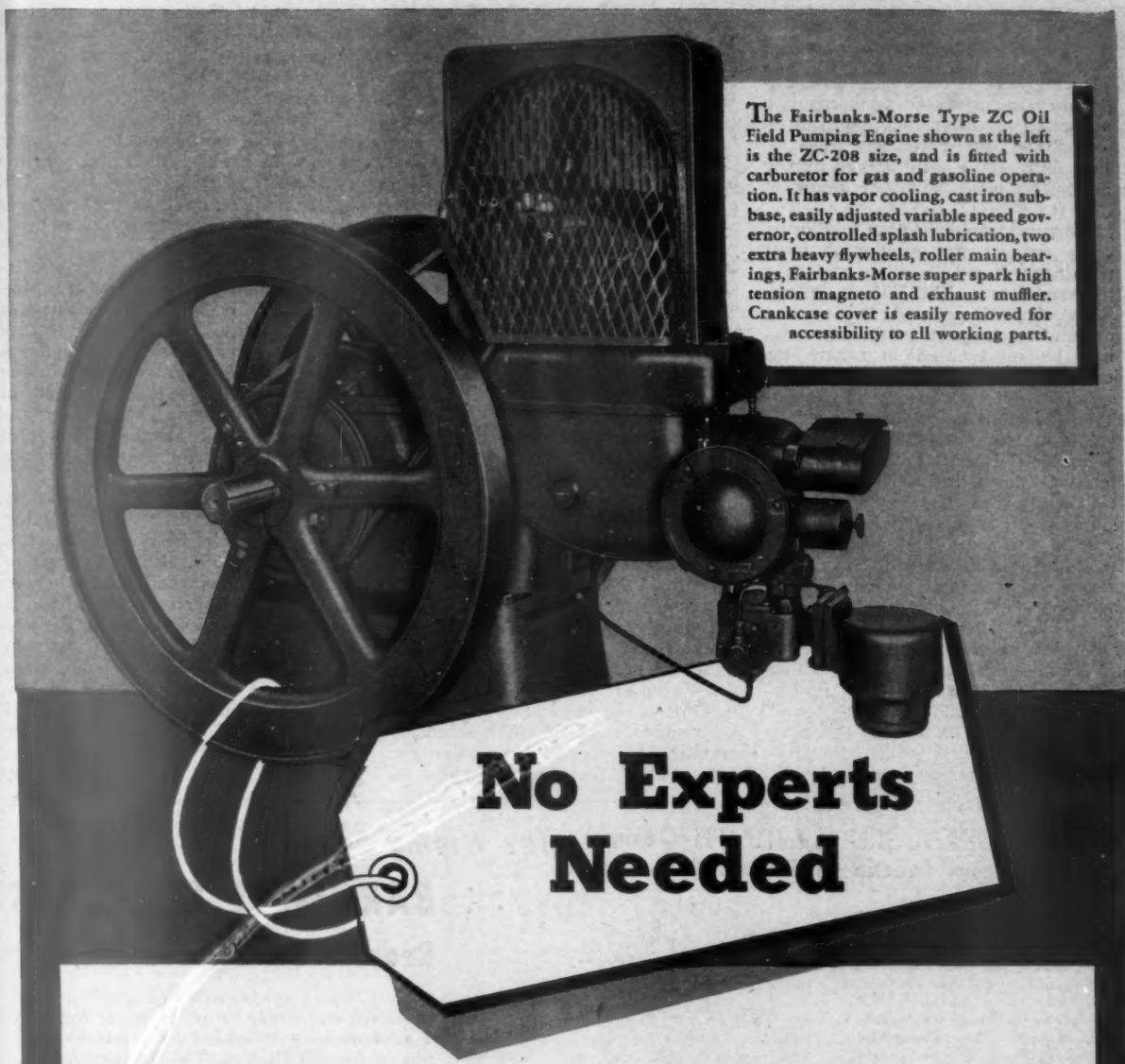
Georgia

During the past year little drilling has been undertaken in Georgia. Four wildcat tests were drilled and completed. They drilled a total footage of 13,470 ft. with an average depth of 3,367 ft. The average depth of a wildcat here is raised, due to a 7,320-ft. dry hole in Early County. The only showing reported was at a depth of 680 ft. in Wayne County.

Scattered drilling over the period of the last 5 years has developed little, beyond the fact that the southern third of the state may be of interest, since beds are present that

LEGAL

U. S. DEPARTMENT OF THE INTERIOR. General Land Office, District Land Office, Las Cruces, New Mexico. Notice is hereby given that the lands herein described within the known geologic structures of the Pecos Valley and Red Lake oil and gas fields, New Mexico, are offered to qualified bidders of the highest cash amounts offered per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act, as amended by the act of August 21, 1935 (49 Stat. 675, 30 U.S.C. 226), at a sale to be held in the District Land Office at Las Cruces, New Mexico, at 10 a.m., on May 18, 1944, in the following parcels, all in T. 17 S., R. 28 E.: Pecos Valley Field, Parcel No. 1, lots 1, 2, 3, 4, S½ N½, E½ SE¼ Sec. 3, E½NE¼ Sec. 10. Parcel No. 2, W½W½ Sec. 5 Red Lake Field. Parcel No. 3, SW¼SW¼ Sec. 10. Parcel No. 4, NE¼ Sec. 15. Each successful bidder must deposit on the date of sale with the officer in charge of the sale a certified check or cash for one-fifth of the amount bid by him, and file the showing of qualifications to receive a lease, required by section 7 of Circular 1386. The remainder of the bonus bid and the annual rental at the rate of one dollar per acre must be paid and a $5,000 corporate surety bond must be furnished prior to the issuance of the lease. Each parcel will be offered for sale separately, but the successful bidder of the two parcels in either field may consolidate the two parcels in a single lease and may file a collective bond. Bids may be submitted by mail provided they are accompanied by one-fifth of the bonus bid and a showing of qualifications of the bidder. The envelope should be plainly marked for opening on the day and hour of the sale. Bidders are warned against violation of section 50, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids in the discretion of the Secretary of the Interior. Paul A. Roach, Register.



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are producing to the west.

Florida

During 1943, 11 tests were drilled in Florida. One of these tests resulted in a small producer. The depth of an average wildcat here was 3,902 ft. Only four of the tests drilled during the period went below a depth of 5,000 ft.

The stratigraphic section in Florida offers chances for production from formations found in other states in the coastal area. The Wilcox, Selma, Eutaw, Tuscaloosa and Paluxy are present in some parts of the state and may be represented in others by equivalent beds of the same geological age. This does not necessarily mean that sands that have proved productive in other areas will be present,

Humble Oil & Refining Co. 1 Gulf Realty Co. test is in 29-48s-30e in Collier County. This test was located on a block of approximately 1,000,000 acres at the south end of the state. In July 1943, oil showings were reported in lime and dolomite at a depth of 9,800 ft. The showings were heavy black oil and occurred in the interval from 9,800 to 9,848 ft. in Lower Cretaceous. The test was drilled deeper to 11,626 ft. and it is reported that saturated lime pay was found from 11,600 to 11,626 ft. Pumping equipment was installed and the first reports of production indicated that it would make from 90 to 100 bbl. of 20° gravity crude per day, along with from 400 to 500 bbl. of water. Another report at a later date indicated that the test was capable of making 200 bbl. of fluid of which 25 per cent was heavy oil.

The pay section encountered at 9,800 ft. has not been tested. It is possible that another productive horizon will be developed at this depth when results of testing are reported. Oil showings have been reported in deep tests in Mississippi in formations of this same age, which suggest that these beds may be present under all of this coastal area.

Regional Structure

Geological work and drilling have developed a number of regional structural features (Fig. 1). Structurally higher areas, as well as basin areas, are masked at the surface by formations which, in Mississippi, Alabama and Georgia, rise northward toward the mountains and away from the coast. In Florida, formations rise from the coasts toward the axis of the south plunging Ocala Uplift, which forms the main structural backbone through the length of the state. Throughout all of the area the regional dip is toward the Gulf of Mexico. In the subsurface, the regional dip is interrupted by structural features that are extensive. Without these regional uplifted areas, we would be dealing with a monocline in which the beds dip southward at an average rate of approximately 75 ft. to the mile. The rate of dip is not constant and varies in different areas. The structural interruptions account for regional as well as local changes in dip. The beds, which make up the geological section, have been laid down leaflike so that progressively older formations outcrop inland from the coast.

The area shown in Sharkey and Issaquena counties in west central Mississippi has been called the Sharkey County Uplift. This regional feature is associated with an area of igneous activity which involves the Monroe and Richland gas fields located in northern Louisiana. The Jackson gas field, in central Mississippi, is also associated with an area of igneous uplift.

The McHenry High is located in southeastern Mississippi. A number of dry holes have been drilled on this large feature and, although shows of oil have been reported, no production has been developed. Wildcat drilling indicates the presence of excellent sands in the Eutaw and Tuscaloosa formations. Deep tests have been drilled into the basal sands of the Tuscaloosa at depths of 8,000 to 10,000 ft. The deepest test on this structure is the Humble 1-B Dantzler, 20-5s-8w, Jackson County, which found the

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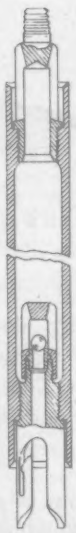

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Upper Cretaceous-Lower Cretaceous contact at 8,905 ft. and at 11,230 ft. was bottomed in beds that may be of Travis Peak age.

The structural basin west of the McHenry High and south of the Jackson Uplift in southern Mississippi is important. It occupies the southern one-third of the state and is the area where exploration has been concentrated. Drilling has indicated that the prospects for commercial quantities of oil are possible in four different horizons. This basin contains different types of local structure and is the scene of extensive geophysical work and leasing.

The southern half of Alabama is promising. The Hatchitigbee Anticline is the only large structural feature known in this part of the state. This large folded area covers parts of Choctaw, Washington and Clarke counties and is sizable enough to be a regional feature. Beds are present that are producing elsewhere and a number of deep tests have been drilled without success. Several of these tests were apparently well located on structure. There has been little exploration in Alabama, prior to this time, and it is suspected that there are yet many details to be learned about structure, source beds and sands. There is a question concerning the types of structure on which these formations will be found. From a regional standpoint, southern Alabama is currently considered as a basin in which systematic exploration may encounter commercial production.

There are no regional structural features known in the southern one-third of Georgia. A possible exception is the effect of the Ocala Uplift on the subsurface in this area. Tests drilled in southern Georgia indicate that possible oil-bearing beds exist, but little has been published regarding the details of either regional or local structure.

The Ocala Uplift in northern Florida has affected sedimentary beds over a wide area. It has brought lower formations close to the surface and tests that have been drilled indicate that formations are present that may be productive of oil and gas. Structurally, Florida is a south-sloping backbone with a higher hump at the north end. Some irregularities are known to exist east and west from the main feature.

Another major feature in the area is the Appalachicola basin. This downwarped area involves sediments in southeastern Alabama, southwestern Georgia and northwestern Florida. Little detailed information is known about this basin, although regionally it is expected to be lower than areas to the east, northeast and north.

Geological Divisions

On the geological map of the United States, the area of these four coastal states is divided into two provinces. Fig. 1 shows the approximate area covered by (1) the Coastal Province and (2) the Paleozoic Province. Sediments in the Paleozoic area are much older than those in the coastal area. Most of the late activity has been concentrated in the area to the south where younger sediments are present. The younger beds overlap the older beds and, in the border area between the two provinces, deep tests penetrate Paleozoic formations below the younger material.

In the coastal province, tests have encountered sediments from Eocene age to Jurassic age. In the gulf coastal area, west of the Mississippi River, these formations contain sands which have a record of production. Drilling east of the river has indicated that these same formations are present. In Mississippi, fields are now producing from these horizons. In southern Mississippi, eastern Alabama and, more recently in southern Florida, drilling indicates that interesting formations within reach of the drill contain sands in which oil and gas shows have been found. It is reasonable to expect favorable conditions in south-

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western Alabama, especially since production has been developed close to the western boundary of the state. Georgia is still somewhat of a mystery. Recent showings of oil in southern Florida have added to the possibilities within that state.

Stratigraphy

Fig. 2 shows a generalized stratigraphic section, together with the known producing sands. A stratigraphic section constructed for this large area must be of a general nature, since there are many details of lateral lithologic changes which place correlation in dispute. An attempt has been made to use formation names that are common to the area as a whole.

The thickness of the stratigraphic section varies. Tests drilled on either regional or local structure do not give the true maximum thickness of the section in that area. Tests drilled in the northern part of the coastal area will drill shorter stratigraphic sections than tests in the southern part of the area. It is reasonable to expect as much as 18,000 ft. of sediments in the southern part of Mississippi or Alabama. Wildcat drilling in southern Georgia gives reason to expect a thinner section above the Paleozoic, although this is not proved. In southern Florida, wells have drilled to the Lower Cretaceous at depths between 11,000 and 12,000 ft. Because of regional structure, older beds should be more shallow in the northern part of this state.

Wilcox

The Wilcox formation of Eocene age is producing in the Cranfield field in Adams County, Mississippi. It outcrops in northeastern Mississippi where it is from 500 to 800 ft. in thickness. The thickness increases southward until, in Adams County, it is reported to be 3,300 ft. In the area of the McHenry High, it is 2,000 ft. thick. Off structure in southern Alabama, it may reach a thickness of 2,500 ft. In southern Georgia, the thickness may vary from 500 to 1,000 ft. Beds of Wilcox age have been identified in Florida.

The Wilcox is represented by a thick section of sands and shales. Sands within the formation normally have a lenticular habit and present a problem in sedimentation. Sands may be encountered anywhere in the section and where they are present on structure, it is worth while to test any showings recorded. Although it has been tested at many points, the Wilcox is not considered, as yet, to be a pay horizon of major importance in Mississippi.

Selma Chalk

The Selma chalk is one of the most important pays in Mississippi. It varies in thickness and lithology and it is hard to predict what character it will have in any wildcat. There are cases where it is logged as a chalk, others where it is considered a limestone and still others where it may be sandy. The production from this horizon is usually found in sandy limestone, although in the Tinsley field the productive lower portion is sand. It is an outstanding marker, since it indicates the top of the Upper Cretaceous over a large part of the area.

Eutaw

The Eutaw formation of Mississippi and Alabama is the age equivalent of the Brownstown Tokio Section of Louisiana and Texas. It is predominantly a sandstone and shale section which varies from 100 to 600 ft. in thickness. Shale "breaks" are common, and sands have the habit of pinching out within short distances.

Tuscaloosa

The Tuscaloosa formation occurs immediately below the Eutaw and is the age equivalent of the Eagleford-Woodbine of Texas and Louisiana. It, too, is a section of alternating sands and shales. The upper portion may contain oil-bearing sands, although the best-known horizon occurs at the base of the section. It varies in thickness from 900 to 2,000 ft. Sands pinch out irregularly and the formation here presents the same characteristics as the Woodbine of Texas. The Basal Tuscaloosa sand is the most important pay found within the section. Oil is now being produced from this horizon in several fields in southern Mississippi. The producing sands range in thickness from 40 to 100 ft. and porosity is usually good. Production from these sands will range from heavy oil to distillate.

Paluxy

Where it has been found in Mississippi and Alabama, the Paluxy represents the top member of the Lower Cretaceous. On structure, it lies unconformably below the Tuscaloosa. Shows of oil have been reported in Mississippi and it offers possibilities as an oil horizon in this area.

Lower Glenrose

The Lower Glenrose of the Trinity is an important oil-producing horizon in Louisiana, Arkansas and Texas. Deep drilling has indicated that equivalent beds are present under Mississippi, Alabama and Florida. In Mississippi and Alabama, little has been published concerning this formation since few wells have penetrated it. In Texas and Louisiana, the section is composed of anhydrite, limestone and shale. In Mississippi the section is more shaly, although anhydrite has been reported. Deep tests in Mississippi have found showings of oil and gas, although no production has been developed except in Florida.

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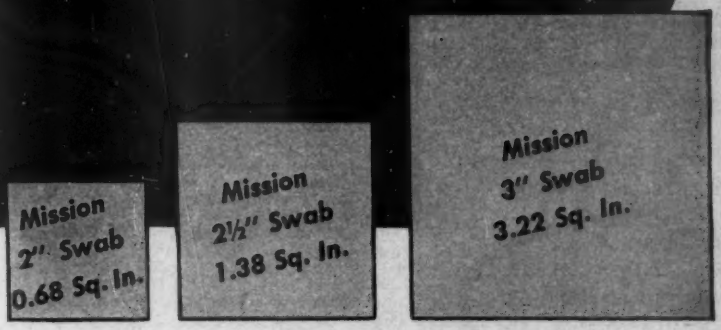

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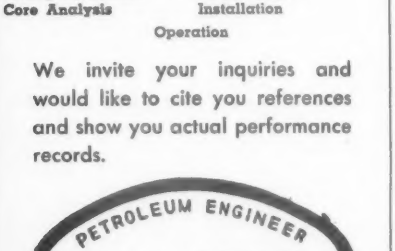

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N. CENTRAL TEXAS

Kerlyn Opens Caddo Lime Pool in Young County

WICHITA FALLS.—Kerlyn Oil Co. 1 Cope, 1½ miles southeast of Jean, reports a preliminary gage of 26.6 bbl. in 6 hours through ⅜-in. tubing choke with perforations at 4,385-97 ft. and 4,418-28 ft., opposite Caddo lime. This well opens a new Caddo lime pool for Young County in an area spotted with small pools. A new Caddo pool for eastern Young County is Thomas D. Humphrey 1 Graham, G. W. Roberson Survey, which flowed 299 bbl. of oil in 7½ hours through ¼-in. choke from Caddo lime at 3,995-4,040 ft. Total depth is 4,160 ft.

Clay County.—Consolidated Oil Corp. 1 J. A. Gilbreth, San Augustine University Survey, east of Joy, lost circulation at 6,112 ft., and is believed to be in the Mississippi lime section, showing a little oil. Continental Oil Co. and W. B. Omohundro 1 Lena Courtney, in the E. Hall Survey, northeast of Henrietta, was dry at 6,601 ft.

Cooke County.—Northern Ordnance, Inc., 1 Lindsey, northeast offset to the discovery well in the Woodbine Strawn sand pool of eastern Cooke County, topped the Ellenburger at 4,648 ft., after passing numerous shows of oil in shallower horizons. The 7-in. casing was cemented at 4,682 ft., total depth 4,875 ft. No shows in the Ellenburger were reported. Magnolia Petroleum Co. 2 Sallie Long, in the Horseshoe Bend area, drilled to 5,236 ft. in dry sand, and was shut down.

Montague County.—Continental Oil Co. 1 Luna, Blk 97, Hill County School Land, in the Mueller pool, was completed for an initial of 210 bbl. per day from lime pay. The same company's 1 Hundley, Martindale Survey, wildcat near Mallard, had a show of oil at 5,709-16 ft., and was coring ahead.

Hardeman County.—Humble Oil & Refining Co. has staked a wildcat, 1 T. F. Reilly, in the H&TC Survey, 41 miles northwest of Chillicothe, scheduled to go 7,500 ft.

NORTH CENTRAL TEXAS WILDCAT COMPLETIONS

Archer County: G. W. Cooper 1 Fain-Parkey, Sec. 2, SP Ry. Sur., 140 bbl., perf. 3,897 ft., TD 3,940 ft.

Cooke County: Martin Properties and J. W. Hastings 1 J. G. Canon, J. F. Johns Sur., dry at 1,386 ft.

Wichita County: Bridwell Oil 2 J. S. Bridwell, AB&M Sur., dry at 2,069 ft.

Bridwell Oil 3 J. S. Bridwell, AB&M Sur., dry at 1,730 ft.

Wilbarger County: Texas 1 Bankers Life Ins. Co., John Cox Sur., dry at 5,534 ft.

WEST CENTRAL TEXAS

ABILENE.—The second well for the Bluff Creek sand pool in eastern Jones County, John P. Byram 2 Alexander trust estate, east offset to the discovery, registered an official potential of 126 bbl. per day from pay at 1,647-58 ft. It hit the top of the pay at 1,631 ft., where casing was cemented after drilling to 1,634 ft. The hole was filling with oil at the rate of a bailer every 2 minutes. The third test is to be started soon.

In the Hardy pool of Jones County, Great Lakes Carbon Co. 1 Braden, south of the discovery and the third producer for the pool, flowed 168 bbl. through 14/64-in. choke from Canyon sand pay at 3,695-99 ft. The operators have staked 3 Hardy as a northwest offset.

W. D. Brookover I Kelso, Lot 101, in League 126, De Witt County School Land, was abandoned at 2,845 ft. after both the Hope and Gunsite horizons proved dry.

Hunter & Hunter 1-C A. E. Pardue, 1½ miles northeast of the Strand pool, was dry at 5,030 ft.

WEST CENTRAL TEXAS WILDCAT COMPLETIONS

Jones County: John P. Byram 1 Alexander Trust, Sec. 3, Blk. 14, T&P Sur., 126 bbl. 38-gravity, Bluff Creek sand, TD 1,658 ft. Discovery.

Palo Pinto County: A. J. Rife and associates 1 W. H. Belding, Sec. 1, AB&M Sur., dry at 4,809 ft.

OKLAHOMA

West Moore Offset Gets Wilcox Production

THE big news in Oklahoma this week is the performance of Mid-Continent Petroleum Corp. 2 Harris, in the NE cor. SW 29-10-3w, north offset to the discovery well and the second well in the West Moore field. Second Wilcox sand is reported from 8,795-8,842 ft., and the well came in flowing about 50 bbl. per hour of high gravity oil. After being choked back, late reports indicate it will flow from 400 to 500 bbl. per day through a 26/64-in. tubing choke.

Mid-Continent 1 Tubbs, the east offset to the discovery well, has completed testing a sandy dolomite found below the second Wilcox and is ready to perforate opposite the Wilcox. This well was reported unofficially to have nearly 100 ft. of second Wilcox sand, and some oil men think will make a better well than the 2 Harris. In-

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terest in the Tubbs well is especially keen, because of light it will throw on the prospects of the Navy emergency landing field to the east in Section 28. A resolution has been introduced in Congress to allow this land to be sold or leased.

The magic of the name Wilcox in Oklahoma is indicated by reports of acreage close in to the producing wells changing hands at prices approaching $4,000 per acre. Depth makes no difference; so long as a reasonably thick Wilcox sand body is present, acre yields are usually high, and sweet crude of high gravity is in demand.

OKLAHOMA WILDCAT COMPLETIONS

Carter County: C. W. Tomlinson 1 Jackson, SE SE SW 26-5s-1e, dry, TD 3,990 ft., Arbuckle 3,713 ft.

Lincoln County: Mid-Continent Petroleum-Atlantic Refining Co. 1 Kirchmeier, SW NW NW 9-12n-3e, dry, TD 5,577 ft., Wilcox 5,481 ft., second Wilcox 5,561 ft.

Logan County: Texas Co. 1 Tilman, NW NW SE 27-17n-1e, dry, TD 5,157 ft., Wilcox 5,025 ft., second Wilcox 5,134 ft.

Pawnee County: Northern Ordnance, Inc. 1 Blackhawk, SW NE NW 16-22n-3e, dry, TD 4,409 ft., Wilcox 4,314-27 ft.

Pottawatomie County: Stanolind et al 1 Werrell, NW NW NW 9-7n-3e, 346 bbl. oil per day on 3/8-in. choke, TD 4,887 ft., PB to 4,550 ft., perf. 4,540-45 ft., Hunton 4,547 ft., Sylvan 4,865 ft.

Stephens County: Glenn Grimes 1 Federal Life Insurance, NE NE SE 2-3s-7w, dry, TD 2,388 ft., Pennsylvanian sand 2,365-84 ft.

WILDCAT COMPLETIONS AND DISCOVERIES

	Week ended Apr. 15, 1944					Cumulative total, 1944				
	Oil	Dist.	Gas	Dry	Tot.	Oil	Dist.	Gas	Dry	Tot.
Ohio	0	0	1	0	1	0	0	7	17	24
Indiana	1	0	0	1	2	2	0	0	4	6
Kentucky	1	0	0	1	2	4	0	0	16	20
Illinois	0	0	0	3	3	6	0	0	74	80
Michigan	0	0	0	2	2	4	0	0	60	64
Kansas	1	0	0	9	10	17	0	2	117	136
Nebraska-Missouri-Iowa	0	0	0	0	0	1	0	0	6	7
Oklahoma	1	0	0	5	6	14	0	6	62	82
Texas:										
North Central	2	0	0	5	7	13	0	0	74	87
West	0	0	0	6	6	8	0	0	42	50
Panhandle	0	0	0	0	0	0	0	0	2	2
East	0	0	0	0	0	2	0	0	36	38
Gulf Coast	0	0	0	3	3	15	4	3	57	79
Southwest	1	0	0	5	6	12	3	7	68	90
Total	3	0	0	19	22	50	7	10	279	346
Louisiana:										
North	0	0	0	2	2	2	0	0	18	20
Gulf Coast	0	0	0	0	0	2	4	0	18	24
Total	0	0	0	2	2	4	4	0	36	44
Arkansas	0	0	0	1	1	2	0	0	16	18
Mississippi and Southeast	1	0	0	2	3	4	0	0	25	29
Montana	0	0	0	0	0	1	0	0	2	3
Wyoming	1	0	0	0	1	5	0	0	6	11
Colorado, Utah	0	0	0	0	0	1	0	0	4	5
New Mexico	0	0	0	1	1	0	0	0	19	19
California	0	0	0	2	2	3	0	4	38	45
Total United States	9	0	1	48	58	118	11	29	783	939
Total previous week	9	0	1	57	67					

WILDCAT completions continue to follow an unusual course because the total for the first 15 weeks of this year continues to hover around an average of 63 completions per week, yet the percentage of oil wells continues to rise steadily. The first four weeks of this year were rather poor, with only 8.8 per cent oil wells, but this has risen fairly uniformly, until the percentage of oil wells to total wildcats is hitting close to 15 per cent. In spite of this favorable trend, the total number of completions shows no signs of increasing, yet there is a substantial demand for new oil reserves. The answer is probably the same as that to many other questions; shortages of manpower and materials plus lack of adequate price incentive.

LA.-ARK.

Atlanta Field Gets Extensions

MAGNOLIA, Ark. — The Atlanta field seemed about to have an east extension as Durbin Bond 1 J. L. Hendricks in 13-18-19 found the top of the lime at 7,956 ft., top of Reynolds at 7,963 ft., top of oil porosity at 7,975 ft., and water level at 8,003 ft. Pipe is now being run for completion. The Hendricks well checks flat with the Tide Water Associated and Joe Mahoney wells to the west and 5 ft. higher than the Vaughan well to the north.

In the west end of the field, Tide Water Associated Co. 1 J. S. O'Bier, SE NE 18-18-19, appears to have proved up an additional 2-square-mile area. This well was perforated in the Cotton Valley between 7,075-77 ft. and completion is expected soon.

MISSISSIPPI

JACKSON. — Performance of Gulf Refining Co. 1 Lewis-Morrison unit, second well drilled in the new Heidelberg field, Jasper County, leaves little doubt that this field will prove to be one of the most outstanding discoveries of the year. With the hole bottomed at 5,050 ft., casing was perforated at 4,518-48 ft., and during the first 24 hours it flowed 1,001 bbl. of pipe-line oil through a 22/64-in. choke. Tubing pressure was 240 lb. A later 18½-hour gage showed the well flowed 457 bbl. through a 16/64-in. choke.

The well is in 30-1n-13e, an offset to the discovery well, completed in February in what was believed to be the Eutaw sand of Cretaceous age at 4,958-68 ft. In addition to opening a new producing sand for the structure, drill-stem testing at 4,830-90 ft. and 4,898-4,950 ft. recovered pipe-line oil. The Eutaw was reported logged at 4,415 ft. and the Tuscaloosa at 4,992 ft. Correlated with the discovery well, it is structurally higher. As a result of the completion, leasing is reported brisk with the prospect that development throughout the state will be increased.

KANSAS

Sheridan County Test Looks Promising

KANSAS wildcatters had a poor week, with only one producer to eight dry holes, but next week promises to be much better, as six or seven wildcat tests looked like producers. Sheridan County has one of the most interesting tests, Continental Oil Co. 1 Cramer, an old strat test in the NW NW NE 11-6-27w. After swabbing for several hours, the well is reported to have flowed about 50 bbl. of oil in four hours from the Lansing lime at 3,752-62 ft.

If the Cramer well opens a new pool, it will mark a new northwest limit to the extensive list of fields along the Central Kansas trend, and encourage more activity in the Sheridan, Decatur, Norton and Graham County area.

In addition to the Sheridan County test, two wildcats in Barton County, and one each in Pratt, Reno, Rice and Stafford counties were showing oil, all of them prospective new pool openers, rather than extensions.

KANSAS WILDCAT COMPLETIONS

Barton County: Helmerich & Payne 1 Willcut, NW NW NW 15-19-15w, 200 bbl. per day, TD 3,591 ft., basal sand 3,574-91 ft.

Cowley County: C. F. Wakefield 1 Lipperd, NW NW NW 32-31-3e, dry, T.D. 3,395 ft., Mississippi lime 3,070 ft.

Dickinson County: Wolf Creek 1 Walker, NW NW SE 1-31-1e, dry, TD 3,072 ft., Viola 2,961 ft., Simpson 2,984 ft.

Bay Petroleum 1 Reiff, SE SW NW 8-16-1e, dry, TD 2,706 ft., Mississippi lime 2,659 ft.

Ellis County: Appleman 1 Von Lintel, NW NW NW 4-14s-16w, dry, TD 3,486 ft., Arbuckle 3,460 ft.

Marion County: Sohio Production 1 Voth, SW SW SE 9-21s-1e, dry, TD 3,550 ft., Arbuckle 3,525 ft.

Pratt County: Ohio Oil 1 Leman, SE NE SE 25-27-15w, dry, TD 4,820 ft., Arbuckle 4,738 ft.

Reno County: Helmerich & Payne et al 1 Scheele, NW SW 12-25-5w, dry, TD 4,100 ft., Arbuckle 4,049 ft.

Rush County: Phillips 1 Timken, SE SE NE 13-18-17w, dry, TD 3,589 ft., basal 3,578 ft., granite 3,587 ft.

Saline County: Margay Oil 1 Millikan, NW SW SE 31-14-2w, dry, TD 3,310 ft., Hunton 3,045 ft., Viola 3,230 ft.

FOREST CITY BASIN

ST. JOSEPH, Mo.—F. C. Miller and Harry Harper have drilled into the Bartlesville sand at 1,478 ft. in their 1 Eggar, wildcat test 5 miles east of Oregon in 33-60n-37w, Holt County, Missouri. This is their second attempt on the block. Announcement was made that Miller and The Carter Oil Co. would drill a test in the Carter block north of the Miller-Harper acreage. Carter has held this acreage since 1938, the first year of the present Forest City basin lease play.

In the Tarkio pool of Atchison County, Cities Service Oil Co. 1 Wallace Watkins in 32-65n-39w, had 5-in. pipe stuck in the hole 160 ft. off bottom, and a cable was broken. This trouble is delaying a test of the Bartlesville sand, which was reported topped at 1,398 ft. The well is a south offset to 2 Cook, a Bartlesville well owned by the same company.

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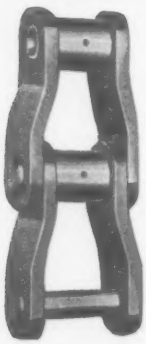

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Drilling Contractors

General Petroleums, Ltd., of Calgary are handling the contract for 1 Riley-Lloyd in LSD 16, 5-23-14w4 in the Hutton area of the Alberta central plains. Rotary outfit is used for a deep test of the Devonian limestone.

Newell & Chandler of Calgary, Alta., have contracts for 1 Major and 1 Universal Petroleum, both in the Taber field of southern Alberta.

Nicklos Drilling Co., Houston, was preparing to make a production test of a new sand on the south side of the South Roanoke field, Jefferson Davis Parish, Louisiana. The well is being drilled for Continental Oil Co. on the Sturdivant lease, and is bottomed at 11,585 ft., with the production test slated to be made below 11,000 ft.

Loffland Brothers, Houston, opened a new Wilcox sand discovery in Southwest Texas with the completion of Arkansas Fuel Oil Co. 1 William Buehrig, located 3½ miles northwest of Meyerville, De Witt County, Texas. Total depth of the well is 9,017 ft., with the well flowing gas and distillate through perforated casing at 7,627-35 ft.

Al Buchanan, San Antonio, drilling for Butcher-Arthur, Inc., on a wildcat 5 miles southeast of Yorktown, De Witt County, Texas, is reported to have logged some showings in 1 Kilodzieyezky which is bottomed below 7,400 ft.

Fain Drilling Co., Houston, was preparing to make a production test at Continental 1 S. H. Reed, 4½ miles south of the Slick-Wilcox field, Goliad County, Texas. Total depth is 9,019 ft., with 6-in. casing cemented on bottom. The same company's 1 Heard, also drilled by the firm and located in the same county, continues to flow gas-distillate from sand at 8,400 ft. to establish a new field.

Housh & Thompson, Houston, was preparing to make a production test of Northern Ordnance 1 Ammann, 1½ miles north of the Nada field, Colorado County, Texas. Total depth

Crew of Arrow Drilling Co., in West Edmond field, Oklahoma County, Oklahoma: L. D. Farra, driller; Earl Morgan, E. D. Morgan, Carl Hall and C. R. Daniel

is 6,800 ft., with 5½-in. casing cemented at 6,798 ft.

Longhorn Drilling Co. has apparently opened a new Wilcox sand discovery in McMullen County in Southwest Texas with the showing of Atlantic 1 Atkinson. Drill-stem testing below 6,800 ft. recovered water white distillate.

W. Stewart Boyle, Houston, is starting two wildcat operations in Jackson County, Texas, one being located 5 miles south of Ganado on the C. A. Barron lease and the other 4 miles southeast of El Toro on the Lorenzon lease.

Fowler Drilling Co., in addition to its other drilling activities, is working on two new wells for Chanslor Canfield Midway Oil Co. in the South Belridge field of Kern County, California.

San Joaquin Drilling Co. recently started a new well on the Shultz lease in the Helm field, Fresno County, California, for Amerada Petroleum Corp., and has resumed drilling following the landing of surface pipe at 618 ft.

Brown Drilling Co. is making good progress on a new well being drilled for Murvale Oil Co. in the Midway-Sunset field, California, and should have another well tanking oil soon on another property of the same operator in the same field.

Prince Brothers Drilling Co., Houston, completed another producer in the Fig Ridge field, Chambers County, Texas, for J. M. Frost. Completion was made in the Frio sand at 8,500 ft.

Rowan Drilling Co., Houston, abandoned J. W. Garth 1 Tyrell, a wildcat located in the Double Bayou area, Chambers County, Texas, at a total depth of 9,228 ft.

Bell & Loffland have started a new well for the Paloma Operators' Committee in the Paloma distillate field of Kern County, California. The Paloma oil sand is found in this field at approximately 10,000 to 11,000 ft.

Brewster-Bartle Drilling Co., Houston, abandoned Navarro 2 Roberts, a wildcat 3 miles southwest of Shepherd, San Jacinto County, Texas, at a total depth of 8,509 ft.

A. R. Sarver has been awarded drilling contract on the C. E. Weller 1 Alfred Wolansky et al Comm., in C NE 36-11n-3w, Gratiot County, Michigan.

Union Rotary Corp. is the drilling contractor on two tests Sun Oil Co. will drill in Missaukee County, Michigan. These are the 10 and the 11 Frank S. Horner, in C S½ SE NW, and C S½ NE NW 12-24n-5w. Contractor will also drill a test for Sun in C N½ NW SE 16-13n -11w, Newaygo County, Michigan.

Clifford Perry will drill on contract the Jacob Bolema 1 Jesse G. Morton Comm., in NE NE SE 10-11n-16w, Muskegon County, Michigan.

L. L. Perrine will drill the Walter A. Roung 1 William Grenell, in SE SE SE 16-2s-16w, Van Buren County, Michigan.

Newman Brothers Drilling Co. is running one rig on a development program for Sun Oil Co. on its 11 Weil Brothers, in Jim Hogg County, Texas, which is a 5,500-ft. contract. The company also has two rigs on wildcats in Duval County, Texas. One is on the Texas Co. 2 Garcia, a 6,500-ft. test in the eastern part of the county, and the other is on Argo Oil Corp. 2 Canales, a 6,000-ft. wildcat in the southern part of the county.

Johnson & Flesher Drilling Co. has the drilling contract on the W. J. & F. G. Fox 1 Derrickson, which has been staked in C NE NE 18-12n-19w, Custer County, Oklahoma, which will be a 9,000-ft. or deeper test on a 14,000-acre block of leases.

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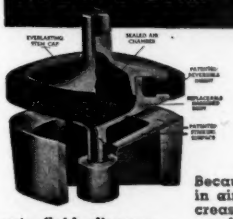

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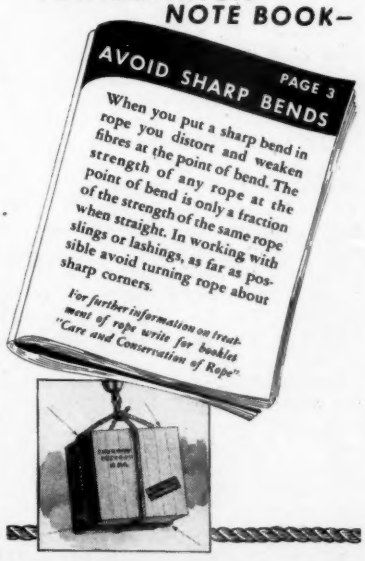
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PERSONALS

California Standard Started in Bahrein On His Judgment

IT was upon recommendation of Fred A. Davies, now president of Arabian American Oil Co., that Standard Oil Co. of California acquired large holdings at Bahrein and began drilling. The first wildcat test proved a producer. That was in 1930.

From 1931 until 1934 Davies was assistant manager of California Co., a subsidiary of Standard of California, in Texas. His next assignment took him back to the Middle East, where he was manager for the company's interests in Bahrein and later in Arabia, until his return to this country in 1937. He then spent 2 years as manager of production for Bahrein Petroleum Co., with offices in New York. In 1939 he returned to San Francisco as assistant manager of Standard of California's foreign division, and in September 1940 he became president of California Arabian Standard Oil Co. This company in 1944 became the Arabian American Oil Co.

Davies entered the oil industry at the close of World War I, when he took up geological work with a company in Kansas. Upon his graduation from University of Minnesota as a mining engineer he had gone to work for Anaconda Copper Co. as a metallurgist. Then, joining the Army, he was made a research assistant in the Chemical Warfare Service in Paris. In 1922 he joined a subsidiary of Standard Oil Co. of California as a geologist, and he worked in the Rocky Mountain area until 1930, when he was sent to Bahrein.

James A. Price has resigned as district geologist for W. C. McBride, Inc., Tulsa, to join Northern Ordnance, Inc., as manager of its eastern division. He will supervise operations on properties recently acquired by Northern Ordnance in northwestern Pennsylvania and southwestern New York. Holdings in Ohio are to be added to the eastern division. Price's headquarters will be in Titusville, Pa.

A. G. Lindlay, in the design engineering department of The Southern California Gas Co. until he entered war service and recently promoted from major to lieutenant colonel, is now in the Hawaiian Islands. While with the artillery at Kwajalein he lost his hearing for 3 days as the result of the din of battle.

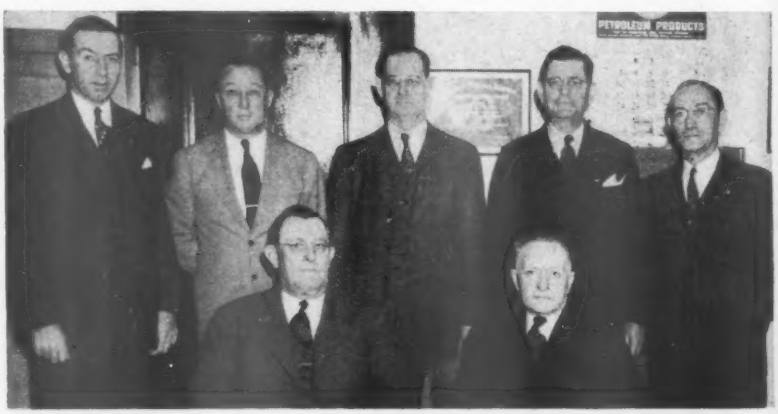
Thomas J. Heard, secretary of Arkansas Natural Gas Corp., Shreveport; **Richard A. Smyer,** controller of Southport Petroleum Co. of Delaware, Dallas, and **Albert A. Robbert, Sr.,** secretary-treasurer of C. T. Patterson Co., Inc., New Orleans, have been elected to membership in the Controllers Institute of America.

Maj. William B. Mobley, on military leave from The Shamrock Oil & Gas Corp., was awarded the Silver Star on April 3 for gallantry in action. He commanded troops of the Thirty-sixth Division who withstood an enemy counterattack at Mount Cattalone on February 13. Major Mobley previously had been awarded the Purple Heart for wounds suffered in action. He is returning to the United States under the rotation system.

Richard J. Smith, New York lawyer and former instructor in law at Yale University, has been named general counsel for the special committee of the U. S. Senate investigating petroleum resources. He is a graduate of Catholic University and of Yale Law School.

John G. Neukom has been named assistant director of the fuel-rationing division and chief of the fuel-oil rationing branch of Office of Price Administration. Neukom, formerly with the management engineering firm of McKinsey, Kearney & Co., of Chicago, succeeds **Laurence Vass** as chief of the fuel-oil rationing branch. Vass is entering war service. Neukom previously had served OPA, helping to plan and operate two major rationing programs—gasoline and fuel oil.

Rex G. Baker, general attorney for Humble Oil & Refining Co., Houston, has been named chairman of initial gifts in the campaign to raise a fund for improvement of Camp Strake, a campsite donated to the Boy Scouts of 13 counties in Texas by **George W. Strake,** independent oil operator



F. R. Smith and J. R. Murphy (seated) each with a 35-year record, were among 342 employes in the Tulsa division of the Gulf companies, including 19 men now in war service, who recently received jeweled emblems and engraved certificates in recognition of 10 to 35 years' service. Standing, each with 30 years' service are S. G. Sanderson, F. P. Rushmore, L. M. Klein, P. L. Reichard and F. H. Zinn. James B. Diggs, 35 years, was unable to be present.

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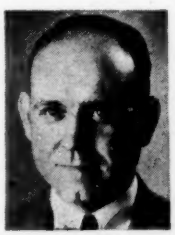
of Houston. The site embraces 2,400 acres, with 115 acres in lakes. Roads and buildings are to be constructed.

Richard Duty, formerly a geologist for W. C. McBride, Inc., Tulsa, who has been an independent geologist in Illinois, is rejoining McBride.

Dr. Willard Henry Dow, who discovered how to make enough magnesium to produce thousands of fighting airplanes, and enough styrene to supply the needs for synthetic rubber, is to receive the Gold Medal Award of American Institute of Chemists for 1944 at the institute's annual meeting in New York May 13. Doctor Dow, president of The Dow Chemical Co., Midland, Mich., graduated from University of Michigan in 1919 as a Bachelor of Science in chemical engineering, and went to work for the Dow company in the same year. He is a member of the advisory board of Chicago Procurement District, Chemical Warfare Service; a director of American Chemical Society, and a member of American Institute of Chemical Engineers.

S. F. Magor, manager of manufacturing and sales for Superior Oil Co. for the past 8 years, has been elected to the board of directors.

L. P. St. Clair and **Stanley W. Morshead,** Los Angeles, have been reelected president and vice president respectively of Independent Oil Producers Agency.



Spencer Robinson, who resigned as editorial director of the oil-trade publications of Gulf Publishing Co., Houston, about a year ago, has accepted the position of director of public relations of the Petroleum Administration for War effective this week. Robinson is widely known in the petroleum industry through his editorial work over a period of 25 years. He has resigned as a member of the city council in Houston to which he was elected in 1943. With PAW he succeeds **Gordon Sessions,** who joined the staff of the Petroleum Reserves Corp.

Paul Jacobi, who has been connected with the sales operations of the Wadhams division of Socony-Vacuum Oil Co., Inc., for many years, will be confined to his home, 2928 North

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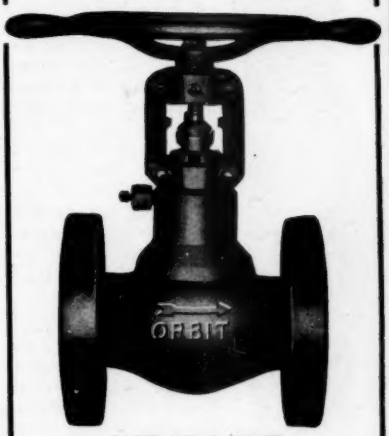


ORBIT WING VALVE

ORBIT WING VALVE

This valve is especially designed for Wing Service. Made in 2" size only in both flanged and screwed ends. Opening through valve is 1⅛". Seats of cast Stellite J Metal.

YOUR ORBIT VALVES

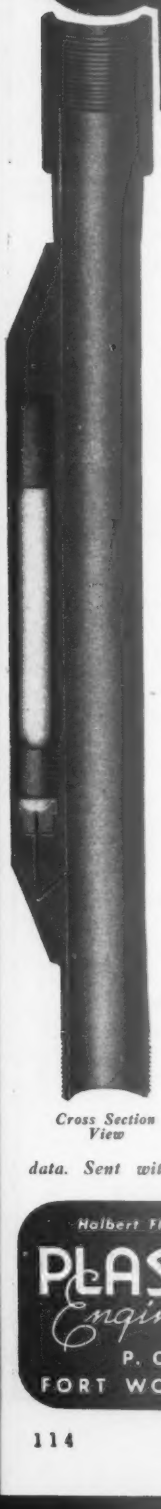
will last for the duration. Meanwhile, if you have any questions regarding their care or maintenance, write us.

OIL WELL IMPROVEMENTS CO.

Since 1912

TULSA, OKLAHOMA

SOLVES Your High Gas/Oil Ratio PROBLEMS



THE HALBERT FLOW VALVE has been proved for over 10 years in several oil fields. It is different from any other flow valve in these design features, (1) Only 1 working part . . . a bakelite float, (2) No diaphragms or springs, (3) No metal parts to wear or get out of adjustment, (4) Only fluid can operate the float.

High gas/oil ratio wells are controlled by a simple installation and no other special equipment is required. The Halbert Flow Valve is also used to assist wells that produce a large volume of fluid, and for wells with a low fluid level. These 3 problems are solved by different types of installations.

Cross Sectional View shows the simple design with the float chamber welded to the tubing section of the valve. Below the float, shown in raised position, are the slotted ports for entry of fluid from the annular space; the other port leading down below the seat permits entry of fluid from the tubing. Gas will not operate the float.

Cross Section View

WRITE TODAY for illustrated folder of diagrams and installation data. Sent without cost or obligation.

Halbert Flow Valve Division
PLASTELITE Engineering Co.
P. O. Box 412
FORT WORTH 1, TEXAS

Summit Avenue, Milwaukee, for several months due to illness. Jacobi for several years was in charge of the Mid-Continent office of his company in Tulsa.

Flight Sgt. Tom Low, of the R.C.A.F., formerly field secretary for Okalta Oils of Calgary, has been reported missing following air operations overseas.

Frank V. Widger, manager of the asphalt sales department of The Texas Co., is the new chairman of the Asphalt Institute's executive committee. He thus becomes the coordinating head of the engineering and research activities of this national association of producers of the petroleum asphalt industry. Born in Churchville, N. Y., and educated in Michigan. Widger joined the asphalt sales department of Texas at Chicago in 1913. He served as manager of the Chicago district from 1919 to 1937, when he was transferred to New York and made manager of the Asphalt Sales Department, his present position. Widger resides at Lynbrook, Long Island.

Neal H. McDonald is the new subsurface geologist for Hunt Oil Co. in the West Texas-New Mexico area. He is an assistant to **Harry Imholz,** head of the office, in Midland, Tex.

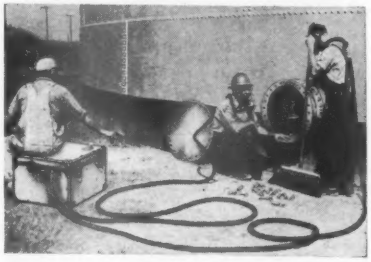
John W. Frey, who was head inspector at the Wilmington, Calif., refinery of Shell Oil Co., Inc., has been advanced to shift foreman.

Roy R. Morse, formerly manager of exploration for Shell Oil Co., Inc., in the Texas-Gulf area and in Shell service since 1925, has been made area manager.

Tom S. Knapp, formerly in the Michigan geological and scouting department of Chartiers Oil Co., resigned that post to join the geological division of Sohio Petroleum Co., with headquarters in Mount Pleasant. Before his association with Chartiers, Knapp was an independent consultant and also was employed by Michigan Geological Survey.

Elmer W. Pollock, vice president and assistant treasurer of Deep Rock Oil Corp., Tulsa, has been appointed chairman of the Tulsa County War Price and Rationing Board's price panel. **W. L. James,** purchasing agent for Stanolind Oil & Gas Co., and **C. W. Cotton,** oil-equipment supplies man, have resigned from the board to resume attention to neglected business.

OUTSIDE AIR FOR THE INSIDE MAN!



DEPENDABLY SUPPLIED BY THE

M·S·A Combination HOSE MASK

By far the most popular hose mask in the petroleum industry, the M.S.A. Combination Mask permits the wearer to enter and work *freely* in gaseous or oxygen-deficient areas. An extra-capacity, hand operated blower furnishes one or two workmen with fresh air through as much as 150 feet of hose.

The M.S.A. Combination Hose Mask is equipped with the M.S.A. "All-Vision" Facepiece, affording comfortable wearing ease, and perfect gas-tight seal. Wide angle lenses give full vision in all directions.

Check the M.S.A. Combination Hose Mask for absolute safety, perfect working freedom and long service life. Full details in Bulletin EB-4.

Available for prompt shipment

MINE SAFETY APPLIANCES COMPANY
BRADDOCK, THOMAS AND MEADE STREETS
PITTSBURGH, PA.
District Representatives in Principal Cities

Crude Price Ceilings Raised In Five Separate Fields

WASHINGTON.—Office of Price Administration has granted increases in crude price ceilings in five separate fields, effective April 25. In all cases purchasers agreed to absorb the increase without change in products prices. Prices are to be adjusted to levels of comparable crudes in surrounding areas. In the Stephens field an added reason for such adjustment is that the prevailing price is below cost of production. In all except the Beverly Hills field ceilings are quoted for a single gravity, but the customary differentials for other gravities are preserved. The increases follow:

Anse La Butte field, St. Martin Parish, Louisiana, an increase of 10 cents a barrel, from $1.20 to the new ceiling of $1.30 for 40° and over. Current production is approximately 7,800 bbl. a day.

Stephens field, in Nevada, Ouachita and Columbia counties, Arkansas, an increase of 10 cents a barrel, from 78 cents to the new ceiling of 88 cents, for 25° crude. Production is approximately 14,300 bbl. a month.

Beverly Hills field, California, an increase of 8 cents a barrel, lifting the ceiling prices from a range of 93 cents to $1.24 a barrel to a range of $1.01 to $1.32 a barrel for gravities all the way from 14° to 40°. Differentials in this field differ from the customary 2 cents. Current production is 119 bbl. a day.

Iron Creek field, Natrona County, Wyoming, an increase of 5 cents a barrel, from $1.20 to the new ceiling of $1.25 for 40° and over. Production is 11 bbl. a day.

G. P. Lease, Carbon County, Wyoming, an increase of 5 cents a barrel, from $1.20 to the new ceiling of $1.25 for 40° and over. Production is 4½ bbl. a day.

Mexican Government Paying For Seized Oil Properties

NEW YORK.—A total of $16,201,688 has been awarded to Mexican Petroleum Co. (California) and Huasteca Petroleum Co., subsidiaries of Standard Oil Co. (New Jersey) by the Mexican Government for oil properties which it seized.

C. H. Lieb, president of both companies, in letters to stockholders, said the award to Huasteca was $10,485,420, plus interest of $2,246,711, on which payments of $5,591,485 have been received. The Mexican Petroleum award was $5,716,428 with interest of $1,224,880 on which payment of $3,048,411 has been received.

These awards are part of the $18,391,641 plus interest which experts appointed by the United States and Mexican governments in 1941 determined was to be paid to Standard Oil Co. (New Jersey) group as compensation for the seizure of oil properties.

Benedum Gets Exploration Lease on Florida Land

TALLAHASSEE.—M. L. Benedum, Pittsburgh, head of Republic Oil Co., has obtained an 11-month oil-exploration lease on about 125,000 acres of land in southern Dade County in which the state owns oil and mineral reservations. The land was leased at 15 cents a full mineral acre a year.

The state also approved an assignment of an oil-lease contract on about 1,000,000 acres of land along the northwest Florida Gulf Coast from Florida Land & Explorations, Inc., to Magnolia Oil Co.

Eastern Kentucky

(Continued from page 102)

cations and an upslant in drilling activities. Three gas wells were drilled in with fair production and several other wells are nearing completion depth.

Rocky Branch Oil Co. completed 2 James H. Fraley in Elliott County with an estimated daily production of 5 bbl. of oil. Rocky Branch Syndicate completed 4 Kimbrell Rucker in Elliott County with a daily production of 10 bbl. of oil. Kentucky West Virginia Gas Co. completed 732 Lourana Slone on Caney Fork in Knott County at total depth of 3,139 ft. in shale with an open flow of 372,000 cu. ft. of gas daily. The same company reports completion of 741 J. S. Cline, on Raccoon Creek in Pike County at total depth of 3,968 ft. in shale with a daily open flow of 119,000 cu. ft. of gas. Kentucky West Virginia Gas Co. completed 5508 Susan Hayes on Jones Fork in Knott County at total depth of 2,833 ft. in shale with a daily open flow of 211,000 cu. ft. of gas.

INDIANA

EVANSVILLE, Ind.—Bennett Brothers 1 Cokes-Schulz, SE SW SE 29-6s-14w, in Posey County wildcat, was completed in Aux Vases sand and produced 56 bbl. the first day after a shot. Carter Oil Co. 1 Sarah Pulley, also a Posey County wildcat, was dry at 2,741 ft.

INDIANA WILDCAT COMPLETIONS

Posey County: Carter Oil 1 Barbara Korsmeier, SW SW SW 2-6s-12w, dry at 2,741 ft., Glen Dean 1,997 ft., Golconda 2,143 ft., Barlow 2,253 ft.

Bennett Bros. 1 H. L. Cokes-Irene Schulz, SE SW SE 29-6s-14w, pumped 56 bbl. after shot in Aux Vases sand at 2,777-88 ft., TD 2,869 ft. Opens pool.

Rocky Mountain Area

(Continued from page 101)

flowed 8 bbl. per hour. Location has been made for 27 Kinney, to the northeast of the three producers.

Brady Block test.—The Texas Co. is preparing to test out the possibilities of the Brady Block, Pondera County, Montana, where it made a small discovery last year in its 1 Schlepp, SE cor. 21-27n-2w. The discovery pumped 25 bbl. in 24 hours from the Sunburst at 1,452-80 ft., and averaged 8 bbl. the first 10 days. The new test will be ⅛ mile to the southwest.

WYOMING WILDCAT COMPLETIONS

Wagonhound, Hot Springs County: Broderick & Gordon 1 Christensen, CNL NE SE 6-44n-98w, perf. 4,302-4,278 ft., swabbed 497 bbl. first 24 hours after acid, TD 4,700 ft.

MARKET QUOTATIONS

Prices as of April 18, 1944

(This service is abbreviated because most refinery products are selling at the Government's price ceilings. Quotations on other products than those shown here furnished on request. Quotations are f.o.b. plant in tank cars and in cents per gallon.)

REFINERY GASOLINE

Octane (A.S.T.M.):	80†	72-74
Mid-Continent*	6.00-6.25	5.750-6.000
Gulf Coast	6.00-6.50	‡5.750-6.250
Northeast Coast	9.80	9.200
California		6.255-6.500

*Basis Oklahoma Group 3. †1939 C.F.R. (research method.) ‡Unleaded.

NATURAL GASOLINE

Grades:	26-70	18-55
Oklahoma (Group 3)	4.750	5.700
North Texas	4.375	5.250
North Louisiana	4.375	5.250
California	4.875	5.500

CRUDE OIL STOCKS

(Bureau of Mines Estimate)

Week ended:	Bbl. of crude*
April 8, 1944	234,172,000
April 1, 1944	234,667,000
April 10, 1943	239,925,000

*Excludes unrefinable stocks in California.

CRUDE-OIL PRICES

Representative posted schedules per barrel.

East Texas	$1.25
Conroe	1.43
Tepetate, Louisiana	1.18
Illinois basin	1.37
Pecos County, Texas	.95
Bradford, Pennsylvania	3.00
Van, Van Zandt County, Texas*	1.08

*No change since 5-21-41.

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Texas*
18-18.9	$0.80	.....	.....	.....
19-19.9	.84	.....	$1.06	$0.70
20-20.9	.88	$0.85	1.08	.72
21-21.9	.92	.87	1.10	.74
22-22.9	.96	.89	1.12	.76
23-23.9	1.00	.91	1.14	.78
24-24.9	1.03	.93	1.16	.80
25-25.9	1.07	.95	1.18	.82
26-26.9	1.11	.97	1.20	.84
27-27.9	1.15	.99	1.22	.86
28-28.9	1.18	1.01	1.24	.88
29-29.9	1.20	1.03	1.26	.90
30-30.9	1.23	1.05	1.28	.92
31-31.9	.....	1.07	1.30	.94
32-32.9	.....	1.09	1.32	.96
33-33.9	.....	1.11	1.34	.98
34-34.9	.....	1.13	1.36	1.00
35-35.9	.....	1.15	1.38	1.02
36-36.9	.....	1.17	1.40	1.04
37-37.9	.....	1.19	1.42	1.06
38-38.9	.....	1.21	1.44	1.08
39-39.9	.....	1.23	1.46	1.10
40 and above	.....	1.25	1.48	1.12

*Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT

Week ended April 8, 1944

(Figures in thousands of barrels daily)

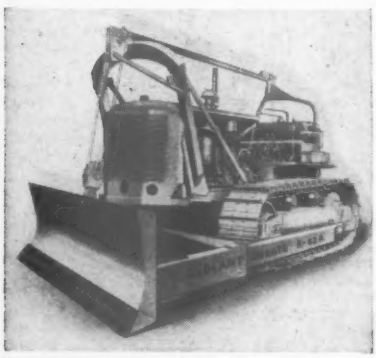
	Dly. crude runs to stills	Stocks: Gasoline	Stocks: Residual	Stocks: Gas oil
Appalachian	134	3,289	328	1,214
Ind., Ill., Ky.	698	20,824	2,565	4,631
Okla., Kan., Mo.	334	8,277	1,273	1,488
Censored area*	2,300	38,216	16,173	14,911
Rockies	105	2,201	566	389
California	783	15,204	30,065	7,845
Total 4- 8-44	4,354	88,011	51,072	30,478
Total 4- 1-44	4,435	89,162	51,326	30,530
Total 4-10-43	3,680	93,410	67,234	30,970

*East Coast, Texas Gulf Coast, Louisiana-Arkansas and Inland Texas.

Equipment Progress

LaPlant-Choate Announces New Earthmoving Unit

A cable-operated "Trailbuilder," designated as model R-82R, and designed for mounting on Caterpillar D-8 tractor, has been announced as a postwar earthmoving unit by LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa. The unit retains the struc-



tural features of the company's dozer line—welded steel construction, box channel frame, box plate blade, pressed and formed sections. The cutting edge has been reinforced with more bolts, while the cutting bits at either end of the blade are single plates formed to fit the ends of the blade for greater wear resistance in rock cuts.

The three-positioned blade can be positively angled either to right or left, or held in straight bulldozing position. Either end of the blade can be tilted up or down with a variation of 14 in. while in straight bulldozing position as well as when the blade is in either angling position. This is quickly accomplished by pulling two pins. The blade can be raised a maximum of 50 in. or dropped 72 in. below the ground line.

Bethlehem Supply Co. Opens New Store at Magnolia, Ark.

Bethlehem Supply Co. announces the opening of a new store at Magnolia, Ark. W. A. Meagher will be store manager and field representative. This store area comes under the general supervision of Fred Parks, district manager, who makes his headquarters at Dallas, Tex.

Bradford Motor Works Gets Army-Navy "E"

In a simple but impressive ceremony, management and employes of Bradford Motor Works, Bradford, Pa., received the Army-Navy "E" award on March 28. John A. Fitzgibbon as master of ceremonies reviewed the requirements necessary to attain the award, which was presented by Lt. Col. John H. Redmond, executive officer of the Pittsburgh Ordnance District. George B. Morris, president of the company, and George A. Gunton, representing the workers, received the flag from Colonel Redmond.

Houdry Expanding Its Laboratory Facilities

Laboratory facilities of Houdry Process Corp., Wilmington, Del., are being expanded, Eugene J. Houdry, president, announced recently.

The new addition will add floor space to the main research laboratories of Catalytic Development Corp., Linwood, Pa. The expansion will virtually double the working space in that building.

"The continuing research into the catalytic transformation of petroleum has brought about the essential need for increasing our research facilities. To this end an extension of brick and reinforced concrete is being added to our present building," Houdry said. "The new extension will permit additional working space to accommodate chemists, technicians, engineers and assistants. Upon completion, most of the corporation personnel will be headquartered at the Linwood laboratories, under the corporation's operating subsidiary, Catalytic Development Corp."

PERRAULT BROTHERS MOVE TO NEW QUARTERS

Perrault Brothers have recently moved to their new and modern quarters at 1130 North Boston St., Tulsa, where they will carry on expanded activity in the pipe-line equipment and supply business. Bo Bardsley joined the organization in late 1943 and is manager of the equipment division.

The new organization will carry on activities of Perrault's former company, Petroleum Coating Machine Co., furnishing line-traveling combination coating and wrapping machines for pipe lines. In addition, they also have stationary, semiportable yard-type cleaning and priming, coating and wrapping machines.

Trade Literature

Peerless Pump Co., 301 West Avenue 26, Los Angeles 31, Calif.—Bulletin 141A, which describes improved methods of pumping water from deep wells. Two basic methods of raising water are illustrated—the turbine and by hypocycloidal.

Lincoln Electric Co., Cleveland, Ohio.—An entirely new and comprehensive arc-welding inspection chart, designed so that operators and inspectors can tell at a glance whether welds are being properly made. This graphically illustrated chart pictures actual specimens of various results obtained in making fillet and butt welds and describes briefly the appearance and characteristics of proper and improper bead welds, with a description of the conditions under which each was made.

Baldwin-Hill Co., 501 Klagg Ave., Trenton, N. J.—A booklet on Insidline, an internal insulation, which was developed to enable ordinary carbon-steel pipe to stand up under pressure and temperature above 1,000° F. By

holding the temperature of the pipe itself to 650° F. or below, "creep" does not occur and the pipe can be operated indefinitely at the usual stress allowances. Insidline is said to simplify pressure piping design, by reducing the number of expansion joints, bends and other expansion provisions.

Macwhyte Co., Kenosha, Wis.—A new 160-page wire-rope buyers' guide. The book has a tabbed index, with contents of each section printed on each index, in addition to a general index. Sixty pages contain helpful information on conservation and care of wire rope. Also included are the latest tables and information in accordance with new simplified practice on wire rope.

Hi-way Service Corp., Milwaukee, Wis.—A broadside describing and illustrating the many uses of the company's Drott bull clam shovel. The shovel is made for tractor operation, and is said to perform most shovel operations, all scraper operations, and all bulldozer operations. All operations are made from the operator's seat while in motion.

Among Equipment Men

Allegheny Ludlum Board Elects Allen Vice President

R. M. ALLEN

At a recent meeting of the board of directors of Allegheny Ludlum Steel Corp. Russell M. Allen, formerly general manager of sales, was elected vice president in charge of sales, according to H. C. Batcheller, president of the corporation.

Allen started his career with Allegheny Steel Co. in January 1920 as a production man in the mill. Two years later he entered the sales department, and in 1923 was transferred to Detroit as a member of the sales organization in that city. After 2 years of service in Detroit, he was made district manager of the Chicago territory, which post he held until 1934 when he was recalled to Brackenridge, Pa., as assistant sales manager. He held this position through the merger and formation of Allegheny Ludlum Steel Corp. In 1940 he became general sales manager.

Goodrich Names Conner and Lang to Executive Posts

C. F. CONNER

Chester F. Conner has been named assistant general manager, and Fred Lang, merchandise manager of industrial-products sales division of B. F. Goodrich Co., it is announced by E. F. Tomlinson, division general manager. Conner had previously been merchandise manager, and Lang had been manager of sole and heel sales.

Conner has had more than 33 years of company service, all in the industrial products sales field. Named manager of sales promotion for industrial products in 1931, he served in that capacity 11 years, until he was made manager of distributor sales in 1942. He was appointed merchandise manager earlier this year. An authority on industrial rubber products, he has served on the advisory staff of the rubber director's office in Washington during the last year and has been prominent in mill supply organizations.

Lang joined the company in 1925, was transferred to the industrial products division a year later, and after holding various executive posts was named operating manager in 1932. He had been manager of sole and heel sales since 1941.

Lilley Takes New Post With Timken Company

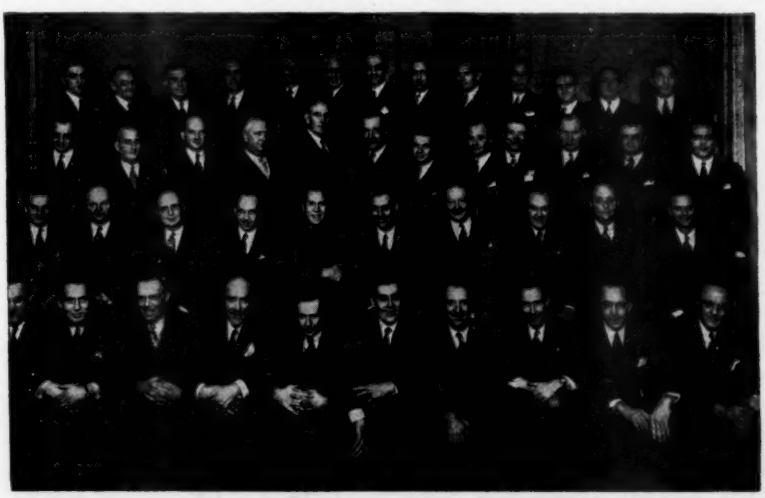
H. B. Lilley, formerly assistant chief inspection engineer, has been promoted by the Steel and Tube Division of Timken Roller Bearing Co. to the position of sales development engineer. He will specialize in the application of mechanical tubing to machine-tool products and other engineering uses.

Lilley has been employed by Timken Steel and Tube Division in various capacities connected with the inspection of tubular products. In recent years, he has specialized in the development of tubing applications to the aircraft industry.

EASTERN REPRESENTATIVES MEET AT PITTSBURGH EQUITABLE FACTORY

The annual meeting for the eastern representatives of Pittsburgh Equitable Meter Co. was recently held at the general offices of the firm in Pittsburgh.

Called in from their territories by Col. W. F. Rockwell, president, the district managers and service engineers from Atlanta, Columbia, Brooklyn, Buffalo, New York, Pittsburgh and Boston offices, met with company executives for a discussion of problems relating to field operations. The engineering staff of the firm conducted a series of meetings for the review of the company's products. Postwar plans and markets were also covered in the 4-day session.



Front row: Maynard, Siedentopf, Obrock, Jerge, O'Grady, Atwell, Gottwald, Gavin Rickets, Abbott. Second row: Hamilton, Lufkin, Kenny, W. W. Dixon, Cloran, Jerman, Col. Rockwell L. A. Dixon, Foster, Arens. Third row: Mowrey, Harper, Gordon, Eyler, Taylor, Moore, Stroyd, Thomas, Andrews, Smith, Rand, Marsh. Back row: McAulay, Brown, Keller, Noyes, Carlon, Oaks, Bixby, Geuss, Finley, Burnette, Fallows, Gleeson, Trimble

Bell Joins Condenser Service And Engineering Co., Inc.

Harold S. Bell, widely known in the field of petroleum engineering, has become associated with Condenser Service & Engineering Co., Inc., Hoboken, N. J. In addition to serving as plant engineer and chief engineer in two outstanding oil refineries, Bell in the past has acted as supervisory engineer for Sinclair Oil Co. and manager of the oil division of M. W. Kellogg Co. For 18 years he has acted as consultant, designer and construction engineer for many oil companies, both large and small, in the United States and in foreign fields.

Bell also is the author of "American Petroleum Refining," D. Van Nostrand publishers, the third edition of which is now in press.

Recently completed arrangements bring together the engineering personel and facilities of C. H. Leach Co. and the manufacturing facilities of Condenser Service & Engineering Co., Inc.

This new organization, operating as the Leach Manufacturing Division of Condenser Service &, Engineering Co., Inc., now installed in their new quarters at 95 River Street, Hoboken, N. J., is geared for the design and manufacture of heat exchangers of every kind and type for the petroleum and chemical industries, through combination of recognized engineering skill and ability to manufacture quality equipment for timely delivery.

Lange Heads Sales of Cardox Fire Division

Appointment of H. W. Lange as sales manager of the fire division of Cardox Corp. of Chicago, Ill., has been announced by Eric Geertz, vice president.

Prior to becoming sales manager, Lange had for several years been chief engineer of the fire division. In this capacity he was in close and continuous contact with the activities of the sales department.

H. R. Harper will succeed Lange as chief engineer of the fire division. He has been assistant chief engineer, with direct responsibility for much of the engineering of Cardox systems. Before that he served as engineer in charge of all field operations.

Ahlers Named SKF Detroit District Manager

Robert R. Zisette, general sales manager of SKF Industries, Inc., Philadelphia, manufacturers of ball and roller bearings, announces the appointment of Walter C. Ahlers to the position of Detroit district manager to succeed Robert H. Hirsch, resigned. Ahlers has held the position of assistant district manager of the Detroit office for a number of years.

Classified Advertising

The Market Place for the Oil Industry

UNDISPLAYED RATE

8 CENTS A WORD, minimum charge $2 per insertion.

SITUATIONS WANTED, 4 cents a word, minimum charge $1.

BOX NUMBERS, count 9 words when replies are to be sent to our Tulsa Office.

10% DISCOUNT if 3 insertions are ordered at one time, with check accompanying order.

All classified advertising payable in advance.

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Classified display advertising set in single or double column style:

1 inch	1 time	$7.00
1 inch	13 times	6.50
1 inch	26 times	6.00
1 inch	39 times	5.50
1 inch	52 times	5.00

Rates are governed by total space used within 12 months from date of first insertion. Credits are allowed when lower rates are earned.

FORMS CLOSE 9:00 A.M. MONDAY
Published Each Thursday

FINANCING

CAPITAL SEEKERS — Interested in raising $25,000 or more for a legitimate project should write to AMSTER LEONARD, Fox Theater Bldg., Detroit 1, Mich.

CAPITAL inexpensively raised. Write for our proposition today. No charge for consultation. Postcards ignored. Address: Service P.O. Box 165, Chicago 90, Ill.

FINANCING

FINANCING

● ONE OF NATION'S most successful money-raisers wishes to contact owner of proven or semi-proven oil property who desires to finance development through public offering.

● JUST COMPLETED sale of West Texas offering; issue oversubscribed.

● OVER 20 YEARS' EXPERIENCE; proven results; finest of references.

● NOT A BROKER or underwriter. Financing done through direct mail campaign sponsored by company, and company handles all funds.

● ADVERTISING prepared, subject to company's approval, and campaign conducted under personal supervision of security sales promotion expert familiar with SEC requirements.

● IF YOU HAVE property of merit, and want satisfactory results, write

JAMES T. CHILES
620 DENHAM BLDG., DENVER, COLO.

FOR SALE—MAPS

GEORGIA AND FLORIDA MAPS Base map north Florida. Base map south Georgia. County maps north Florida and south Georgia. McIntosh Bros., Waycross, Ga.

FOR SALE—MAPS

MISSISSIPPI-ALABAMA BASE MAP. Scale 8 miles to inch. Size 4½ ft. square. Includes Florida Panhandle and eastern Louisiana. Shows County names, County Seats, all oil development, depths dry holes, who drilled them, names of fields, many prospects. Also 16 major anticlines and faults and principal surface geologic contacts in both States from authentic sources. Price $15 paper, $20 linen. Individual field maps on all 7 Mississippi fields showing everything, $3.50 each. Also complete coverage County and Parish maps in South Texas and South Louisiana, many County maps in Mississippi. All fields above area numbering 723 now mapped, $3.50 each.

ZINGERY MAP COMPANY
Houston 2, Texas

MONEY RAISING

WANTED DEVELOPMENT - CAPITAL The Denver Basin. Colorado, large oil structure open for test, geology. Address Box C-278, The Oil and Gas Journal, Tulsa, Okla.

WANTED: Financial assistance to develop proven structure, Carbon County, Montana Shallow drilling. Oil and Asphaltum seepage. Box C-288, The Oil and Gas Journal Tulsa, Okla.

CONTRACTS WANTED

DROP FORGINGS

Rough or completely machined Good delivery.

DROP FORGING DIES

Prompt delivery on drop forging dies. All sizes up to 1½ tons. Largest die sinking plant in West. Write, wire or phone. National Aircraft Equipment Co., 275 No. Avenue 19, Los Angeles 31, California. CA 4111.

Classified Advertising

PATENT ATTORNEYS

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OIL REPORTS

OIL REPORTS
SOUTH GEORGIA
6 month sub. $6.00
C. W. Deming—Publisher
Waycross, Georgia
20 years operating out of Tulsa

DRILLER WANTED

WE have 2600 acres leased about 10 miles S.E. of Fairfield, 40 miles west of the oil field in Illinois. We want to drill into the Trenton limestone similar to the Illinois production. Let me know how you would drill it. Russell Smith, Attorney, Fairfield, Iowa.

SITUATIONS WANTED

EXECUTIVE with invaluable experience gained with major oil companies, especially trained and capable of taking charge of land department of independent company—thoroughly familiar with every phase of the oil business and with wide acquaintanceship with the oil fraternity throughout the Mid-Continent, desires connection with fast growing independent. Draft exempt. Best references. P. O. Box 2133, Tulsa 1, Okla.

GEOLOGIST: Woman, Ph. D. in Stratigraphy from large University. Seven years experience in micropaleontology, sample determination, surface and subsurface mapping. Interested in position requiring variation in type of work rather than specialization in any field. Box C-286, The Oil and Gas Journal, Tulsa, Okla.

GRADUATE petroleum engineer, with fifteen years experience, draft exempt. Can furnish A-1 references. Will consider engineering or sales engineering work. Box C-283, The Oil and Gas Journal, Tulsa, Okla.

EXECUTIVE, age 42, desires connection with progressive organization. 10 years successful management of pipe line system involving construction and operation. Thoroughly familiar with purchasing, office and personnel management, traffic and sales. Invite thorough investigation personal record, excellent health, unopposed to travel. Box C-281, The Oil and Gas Journal, Tulsa, Okla.

MECHANICAL ENGINEER: Ambitious young engineer desires position where initiative is recognized. Experience in stress analysis, pressure vessel and piping flexibility design. Engineering instructor in Internal Combustion Engines and Metallography. Single, 26, 4F. Available in June. Box C-254, The Oil and Gas Journal, Tulsa, Okla.

INDUSTRIAL ENGINEER desires to locate in south or southwest. Ten years experience natural gas production, distribution, construction and industrial sales. Ten years experience industrial furnace design, installation and sales. Reply to Box C-289, The Oil and Gas Journal, Tulsa, Okla.

PRODUCTION ENGINEER, 14 years oil field experience, graduate mechanical engineer. Particular specialties—production by pumping, equipment maintenance, equipment purchasing, and use of instruments for analysis of pumping equipment operation, well conditions and performance. Familiar with personnel problems and relations. Good reputation and health; married, with children. Presently employed, but available. Desire position in Mid-Continent area. Box C-287, The Oil and Gas Journal, Tulsa, Okla.

FOR oil drilling locating we use the Multiple Gravitation Insulation Geology Block System. A positive method. We can locate oil pools from airplane. Draper & Co., Seymour, Iowa, Route 1.

SITUATIONS WANTED

POSITION as field assistant to Construction Superintendent of Refining or Chemical plant. Fifteen years experience covering specs and procedure; process testing, operation and maintenance. Could act as expeditor. 36 years old. Can comply with WMPC. Box C-276, The Oil and Gas Journal, Tulsa, Okla.

HELP WANTED

INSTRUMENT MEN
WANTED immediately by new aviation gasoline refinery using latest instruments. Should be fully experienced in maintenance, calibrations and adjustments on Fisher, Foxboro, and Brown Measurement and control instruments. Write Personnel Manager, Associated Refineries, Inc., Duncan, Oklahoma.

WANTED—INSTRUMENT MEN
FOR new Aviation Gasoline Refinery consisting of Catalytic Cracking, Alkylation and Isomerization units. Location, Middlewest. In reply give detailed outline of previous experience, education, draft status and required earnings for 48-hour week Reply Box C-223, The Oil and Gas Journal Tulsa, Okla.

MECHANICAL DRAFTSMAN WANTED: To redesign, improve, and supervise a line of drilling rigs and production equipment. State experience, age, salary, etc. Reply Box C-273, The Oil and Gas Journal, Tulsa, Okla.

INDEPENDENT oil producer out of city desires accountant capable taking entire charge of office, including income tax; state age, experience, draft status, salary expected in first letter. Box C-272, The Oil and Gas Journal, Tulsa, Okla.

MAJOR oil company has openings available for graduate petroleum engineers having at least 3 years acceptable experience general oil field development. Salary open All hiring will be done in accordance with War Manpower Commission Stabilization plans. Reply to Box C-221, The Oil and Gas Journal, Tulsa, Okla.

WANTED: Registered Engineer experienced on gas distribution systems. Location southern United States. Box C-280, The Oil and Gas Journal, Tulsa, Okla.

WANTED—SAFETY ENGINEER
NATIONAL SYNTHETIC RUBBER PROGRAM

with oil refinery experience and some engineering background, to head up fire and safety group in butadiene plant Los Angeles area. Excellent working conditions and climate. Salary commensurate with qualifications. Write directly to

SHELL CHEMICAL DIVISION
211 Torrance, California

giving full details and if possible, enclosing photograph.

EMPLOYMENT OPPORTUNITIES FOR FOREIGN SERVICE

The Arabian American Oil is interested in receiving applications from technically educated men, and/or men with oil field experience, for work in Saudi Arabia. This offers a splendid opportunity for advancement and postwar security, with good working conditions, hospital and medical care, liberal benefit plans, and vacation privileges in the United States.

Write or apply to our Relations Department

ARABIAN AMERICAN OIL CO.
200 Bush Street
San Francisco 4, California

HELP WANTED

PERSONNEL Director—For crude oil producing Company; to have charge of Labor and Personnel Relations, Safety Program. Selective Service Problems, Employe Insurance Plan; should have background in oil industry, draft-exempt. Give full details in replying. Box C-259, The Oil and Gas Journal, Tulsa, Okla.

CHEMICAL ENGINEERS with experience in any of the following petroleum refining operations (1) light ends recovery equipment, absorbers, stabilizers, etc. (2) catalytic cracking equipment or (3) crude distillation equipment and similar processing units. State in detail educational background, positions held with detailed explanation of work handled, age, and number dependents, also draft status. Foster Wheeler Corporation, Petroleum Refinery Division, 165 Broadway, New York 6, N. Y.

WANTED: A Petroleum Engineer with field experience for engineering development work, with a large manufacturer of oil field equipment and materials. Permanent position with good future for right man. In replying state age, education, business background, salary desired, etc. Box C-250, The Oil and Gas Journal, Tulsa, Okla

WANTED: Major oil company has opening available for engineer interested in liquefied petroleum gas sales and service work. State age and draft status. Statement of availability required. Box C-275, The Oil and Gas Journal, Tulsa, Okla.

Oil and Gas Lease

UNITED STATES DEPARTMENT OF AGRICULTURE, Forest Service, East Tawas, Michigan, April 11, 1944. Sealed bids in triplicate will be received until 2:00 p. m., Eastern War Time, May 22, 1944, and then publicly opened, offering bonus for operating rights in connection with gas and oil leases on eleven parcels of national forest land located in Township 23 North, Range 8 East, Sections 8, 11, 12, 14, 23 and 35 and Township 23 North, Range 9 East, Section 7, in Iosco County, Michigan, containing in all approximately 2040 acres. Bids will be received on any portion thereof or on the entire acreage being offered. Award of lease or leases will be made on the bid or combination of bids bringing the greatest return to the government. Award of lease will be made only to bidder who can show sufficient experience and financial resources and prove citizenship. Interested parties may obtain bid documents, lease forms and operating regulations from the Forest Supervisor, Huron National Forest, East Tawas, Michigan.

LEGAL

Notice of Oil and Gas Lease sale: The U.S. Department of Agriculture will award leases on 15 tracts of approximately 2,480 acres each in Cochran County, Texas, on former Slaughter Ranch. Rent $1.00 per acre. Awards limited to 1 tract per lessee. Sealed bids to be publicly opened May 1. Bid forms and additional information can be secured from Ray E. Davis, Acting Regional Director, Farm Security Administration, Old Post Office Building, Amarillo, Texas.

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Journalisms:

CONTINUOUS, automatic blending of tetraethyl lead with gasoline is now being adopted by a number of refineries, following its initial application at the East St. Louis, Ill., refinery of Socony-Vacuum Oil Co., Inc., Lubrite division. The method, involving the controlled induction of lead into the main gasoline stream, is comparatively new in the oil industry, and a number of advantages are claimed for the method over the previously approved and generally used batch-blending method. Just what these advantages are, and a complete description of the method as used by Socony-Vacuum, will be told in an article scheduled for next week's Engineering and Operating Section.

THE rate of development in the plastics industry during the last 15 years, the almost fabulous number of different plastics, resins and similar synthetic materials which have been developed and which have been applied in countless instances in industrial and commercial utilities is one of the proudest accomplishments of American industry. At least 50 per cent of the plastics which have been developed since 1930 are or can be made partly or wholly from petroleum or natural-gas hydrocarbons. Or so says the refinery editor of the Journal, who has handed in a story reviewing the history of plastics, and the part the oil industry is playing in the development of this fast-growing industry. The story is now in the works and will be presented in an early issue.

ONE of the Journal's editorial staff has recently returned from a tour of fields in South Arkansas, where he surveyed drilling operations in this area. He reported that operators have developed some interesting innovations in standard procedures which may have application elsewhere. His observations will be reported in an early issue. Two factors are credited by one contractor with effecting savings in time amounting to 8 days in the drilling of a 9,000-ft. hole. One of these is the special attention given to spudding in and drilling the first 30 ft. of hole, the other is use of a "mouse hole" close to rotary table for "rat-hole makeup."

CALENDAR

April

NATIONAL OIL SCOUTS AND LANDMEN'S ASSOCIATION, annual meeting Dallas, Tex., April 24-25.

I.P.A.A. AND NATIONAL STRIPPER WELL ASSOCIATION, midyear directors' meeting, Bradford, Pa., April 27, 28 and 29

May

A.I.M.E., Gulf Coast Section, annual meeting, Houston, Tex., May 8-10.

NATIONAL OIL AND GAS POWER CONFERENCE, sponsored by A.S.M.E., Tulsa May 8-10.

A.G.A., NATURAL GAS DEPARTMENT, spring conference, French Lick Springs Hotel. French Lick, Ind., May 11-13.

A.P.I., Mid-Continent District, Production Division. Mayo Hotel. Tulsa, May 25-26

June

CANADIAN GAS ASSOCIATION, annual meeting, Royal Connaught Hotel, Hamilton Ont., Canada, June 8.

A.P.I., SOUTHWESTERN DISTRICT, PRODUCTION DIVISION, Rice Hotel, June 13-14

A.S.T.M., forty-seventh annual meeting Waldorf-Astoria Hotel. New York. June 26-30.

September

N.P.A., annual meeting, Hotel Claridge Atlantic City, N. J., September 20, 21, 22

October

C.N.G.A., annual meeting, Biltmore Hotel Los Angeles, October 13.

November

A.P.I., annual meeting, Stevens Hotel Chicago, November 13-16.